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THE FOODSTUFFS OF THE WORLD THE PLACE OCCUPIED BY WHEAT

Mr. Chairman and Gentlemen:—

I am glad, and very proud, too, to be one of those who have been invited to address the members of the Grain Men's Lecture Club.

I should like to take this opportunity, if I may, of expressing my thanks to so many members of the "Grain Trade" for the valuable assistance they have given to me during the past five years in explaining to me the workings in detail of their own particular branches of the great grain industry. I could not possibly have obtained an intelligent idea of the grain industry, in general, had it not been for the detailed information and data that has been so kindly afforded me by these gentlemen.

I have tried to repay my indebtedness, in part, by endeavouring at every opportunity to spread the truth about the grain trade, the Winnipeg Grain Exchange and the "Futures" system of marketing to farmers in the country, and to merchants and to professional men in villages, towns and cities throughout Canada.

I find that the truth is all that needs to be said to bring much credit to grain men, and respect for the work they are doing; for the truth is that grain men, the grain trade, the Winnipeg Grain Exchange and the "Futures" system of marketing altogether make a most important contribution to the welfare of the people, and to the whole economic life of Canada—to producers and consumers alike, and to all those who render essential services between these two important groups.

I am convinced thoroughly, after as complete a study as I am able to make, that no group of men, in any industry, performs a more important service for humanity than that group which has the responsibility of moving foodstuffs from the farms to the people who live in the cities and other parts of the world.

It seems to me that the hundreds of members of this Grain Men's Lecture Club can do much to assist the industry, with which we are all so proud to be associated, if they will take every opportunity that presents itself of explaining to their friends something about the handling and marketing of grain, and something of the important service to society that is rendered by grain men and by the Grain Trade.

PREJUDICE AND MISUNDERSTANDING

Several years of rather intimate contact with the farmers, merchants, professional men and others of Western Canada has convinced me that an important necessity for the "Grain Trade" is to develop a method of working harmoniously together in order to spread the truth about the good work they are doing, so as to counteract some of the prejudice and misunderstanding that exist, and which most unfortunately have been fostered, and are being maintained, by certain persons whose delight seems to be to shudder with virtuous indignation at "Grain Trade" abuses which do not exist. At least these abuses only exist in the warped imagination of those radical agitators who appear to have an uncontrollable itch to destroy existing institutions.

Your Chairman, Mr. Jones, has kindly permitted me to look over the complete list of the lectures which you will hear during the winter. The thought struck me that any members of this Club who faithfully attend the lectures, and who will spend some time in reflecting upon the matter presented, will certainly, at their conclusion, have a good working knowledge of the way in which grain is handled and marketed, and furthermore, will have a good understanding of the fundamental principles involved in the moving of grains between producer and consumer, through the medium of the markets of the world.

I am quite certain also that the lectures will show quite conclusively how delusive and erroneous is the present widespread common belief that the prices of grains are made by the Winnipeg Grain Exchange, or are made by grain men in these pits.

I think it is correct to say that the greater part of the prejudice against the Exchange, and the misunderstanding about that institution, is due to this common belief,—that grain men on the Exchange "make prices" and furthermore that they delight in making them low rather than high.

GRAIN EXCHANGE A BAROMETER OR PRICE METER

The truth is, of course, that neither the Winnipeg Grain Exchange, nor the grain men, in these pits, have any more to do with setting the price of grain than the barometer has to do with setting the weather.

I like the analogy between the barometer and the Exchange. I like it better than the analogy of the thermometer, for the reason that while a thermometer truly and well reflects and indicates a

part of the weather, i.e. the temperature that exists at any particular moment, the barometer reflects, or indicates, a larger part of the weather, i.e. pressure or weight of the atmosphere, which includes temperature in some measure. But the barometer does more,—besides indicating the present state of the weather, it actually forecasts conditions that are likely to occur in the near future.

The Grain Exchange, or these grain pits, are like a barometer—they not only reflect and indicate existing conditions that govern prices, but as well they reflect conditions that are likely to prevail in the near future, or in other words, just as the barometer forecasts the weather, so also does the Exchange forecast conditions of supply and demand that are to come.

As most of you no doubt know, a mercurial barometer consists of a cup which contains mercury—into which is placed an inverted tall glass tube. As the forces of the atmosphere impinge themselves upon the mercury in the cup the fluid is forced up and down the tube, so indicating the fluctuations of atmospheric pressure, of the forces of the weather.

This grain pit, or bowl, over which I am standing, I like to think, too, is a cup which contains not, if you please, mercury, but something equally as fluid, and as volatile when heated, the minds of men. And as the forces, not of the atmosphere, but of “supply” and “demand” of our economic world impinge themselves upon those minds, then opinions arising from the minds are made to rise and fall, indicating the fluctuations of price, which are recorded not on a glass tube as in the barometer, but on the blackboards attached to these walls.

If any one were to assert that the mercury in the barometer governs the weather, you would say at once that this was a fallacy. Equally a fallacy, I suggest, is the statement often made by some that the minds or opinions on this Exchange floor govern price.

The truth is that atmospheric forces govern the weather, and the forces of “supply and demand” govern price.

A barometer really is nothing more than an atmospheric pressure meter, so the Grain Exchange and these pits really can be said to be a “price” meter.

FORCES OF SUPPLY AND DEMAND

Mention has been made that price is governed by the forces of “supply” and “demand”. These forces are very diverse and

widespread throughout the world, and while my own particular assignment this evening is to deal in detail with the "supply" of foodstuffs, I understand that the balance of the many factors controlling price will be dealt with in subsequent lectures.

It might, however, be fitting, before speaking in detail about the "supply" of foodstuffs, if brief mention should be made of the various groups of other factors besides "supply" that influence and govern price. They are as follows:

(a) The "supply" of any one particular grain, and as well the supply of all other grains, and of all other foodstuffs that can be substituted.

(b) The "demand" for any particular grain, the "demand" for all grains, and as well the "demand" for all foodstuffs that can be substituted.

It will be observed at once that the above form a very complicated group of factors, but even these are only one part of the picture. Next we have—

- (c) The "supply" of money.
- (d) The "demand" for money.
- (e) The "supply" of gold.
- (f) The "demand" for gold.

The above monetary factors "C", "D", "E" and "F" are important, because they form the yardstick that measures price. Unlike other yardsticks or measures, such, for instance, as the inch, the bushel, or the pound, which never vary, unfortunately our monetary yardstick from time to time itself changes in length. It is often very difficult to know when the price of wheat fluctuates, for instance, whether really wheat has changed in value, or whether simply the monetary yardstick, by which the price of wheat is measured, has not itself merely become longer or shorter.

Later lectures will explain in detail how important a factor in the price of wheat and other grains changes in money values really are. Suffice it to say at this moment that the greatest fluctuations by far that have occurred since 1914 to date in the price of wheat have been due not at all to "supply and demand" factors in wheat itself, but rather to changes in the "supply" and "demand" for money and for gold.

Next we have perhaps the most important factor of all, that at all times sets a maximum limit on price, i.e.—

(g) The purchasing power of the people who buy the grains, for very obviously if a working man's family in Europe (who in the main buy our grain) can at the very most spend ten dollars a week, let us say, on food, then by no magic by increasing the prices

of foodstuffs can we extract out of them eleven dollars a week—it simply cannot be done. This affords the explanation as to why sometimes we become irritable and querulous in this country when we find that in spite of seeming shortages of wheat, in spite of fear of war, and in spite of high costs of production to the producer, we are unable to obtain from the buyers as much as we feel our wheat is legitimately worth. The buyers simply have not the money to pay for it—therefore they cannot buy at that price, at least not in quantity.

Still another factor that in normal times does not appear in the picture at all, but which at this time of international disturbance is very much to the fore, is—

(h) The ability or inability of some foreign countries to secure Canadian, and other wheat exporting countries', exchange or currency.

In explanation of this it might be said that the farmers of Canada who haul their wheat to country elevators would not, or could not, accept in payment German marks, Italian lira, or Czecho-Slovakian korunas, for the simple reason that the merchants would not accept such money in payment for goods, nor would the Canadian Government accept it for taxes; therefore the Canadian Grain Companies must pay the farmer Canadian dollars for his wheat—therefore the wagonlot or carload of grain, when exported to Germany, Italy or Czecho-Slovakia, must be paid for by those countries in Canadian dollars, and the only way those people have of obtaining Canadian dollars, in the long run, is as payment for their own goods, commodities and services eventually in Canadian dollars.

Since so many countries, including Canada, put hindrances and restrictions in the way of the importation of foreign goods, then it stands to reason that many countries with goods to export, find difficulty in obtaining Canadian dollars with which to pay for wheat, even though they would like to have the wheat, and are satisfied with the price. Often, therefore, they are unable to make a deal and purchase our wheat because they have no Canadian dollars and cannot get them, for they cannot sell their own goods and products.

The above simple and brief enumeration of the many factors besides "supply" alone that govern price ,and so the use of food-stuffs, will indicate clearly that "supply", important though it may be in itself, is but one factor of the many to be taken into consideration.

"SUPPLY" ONLY ONE FACTOR

There are many examples, both in ancient and modern times, of institutions that have been wrecked and ruined, and of vast sums of money that have been lost, some of this to the taxpayers of both the United States and Canada, due simply to the failure of those guiding these institutions and organizations to take into account any other factors than the mere "supply" situation.

Time does not permit of discussing these in detail, but one important example might be cited because it is probably the most recent, and perhaps the most important, that has occurred in modern times.

Last spring it will be remembered Canada had a rather large surplus of wheat, and many people were rather concerned as to whether it could be sold or not under existing conditions.

Certain prominent persons, you may remember, gave their authoritative and confident opinions—in fact they actually made definite forecasts—that there would be no trouble whatever in selling the surplus—some even went so far as to say that by the following August 1st, that is to say August 1st, 1935, the bins of Canada would be bare, or that at the very least the "carry-over" in Canada would be down to normal (normal usually being considered, for Canada, about 45 million bushels).

Now these good people, in support of their forecasts, presented a most accurate and complete set of statistics which were not denied, for they were true. They were as follows: that the United States had a deficiency of coarse grains,—corn, barley and oats, of over 1,400 million bushels,—that in addition she had a deficiency of over 100 million bushels of wheat, that in addition to this the countries in Europe had a deficiency of several hundred million bushels of coarse grains. So that altogether the world faced a deficiency of probably 2,000 million bushels of wheat and coarse grains, as compared with what the world normally consumed in a year. Therefore, argued our good friends, Canada's mere 200 million bushels of surplus wheat would hardly be a drop in the bucket as compared with the vast quantities that would be needed to supply the above mentioned enormous deficiency.

Now, the statistics presented were quite correct, but in spite of it all, when August 1st came around, instead of the bins of Canada being bare, it was found that the wheat surplus or "carry-over" was larger than ever, and was, in fact, over 200 million bushels, instead of the expected 45 million or even less.

What went wrong? The answer is perfectly simple, and this

instance is discussed not in the spirit of "I told you so", but rather for the purpose of pointing out defects in calculation, so that perhaps a useful lesson may be learned for the future.

DEMAND EQUALLY IMPORTANT

The simple answer is, which some at least foresaw at the time, that the forecast made so confidently only took into account the statistics and the factor of "**Supply**"—that the factors of "**Demand**", which are at all times equally as important as "supply", were entirely left out of calculation,—so that once more the lesson was learned, as it has been so many times in the past, that under certain circumstances, particularly when prices are rising, "demand" can slip away, can disappear just as fast as "supplies" can become decreased. This, in fact, is precisely what happened. No substantial quantities of either wheat or carse grains were purchased by either the United States or Europe to fill the deficiency. The people of the country simply did without, and to the student of these things it is astonishing how people at a pinch, when necessity drives, can do without almost anything.

The reason, perhaps, so great a stress is ordinarily laid upon "supply" and so little upon "demand", is, no doubt, that while there are always most accurate and most excellent statistics of the "supply" of all grains and foodstuffs readily available, yet there are no statistics compiled that will indicate or measure "**Demand**".

Demand can only be appraised by means of good judgment;—and the exercise of good judgment has ever been much more difficult than the mere reading of statistics.

For fear that in view of what has been said, some in this audience may be inclined to belittle the mere "supply" of foodstuffs, I hasten to explain that we are only speaking of "supply" as it affects price; but the "supply" of foodstuffs, it can never be emphasized too much, from the point of view of human welfare as distinct from the point of view of price alone, is by far the most important matter in the whole world.

Never in the history of the world, from the dawn of time, have there ever been sufficient foodstuffs produced in any one year for the needs of all the people. It can be said truly that man's greatest fear, since the dawn of Creation, has been the dread that there would not be sufficient foodstuffs for his bare needs. Man's greatest joy has ever been the sight of abundant foodstuffs.

"ALL FLESH IS GRASS"

I am informed that this Rostrum in which I am standing is technically termed a pulpit. If this is the case, then perhaps I might be permitted to think of you, my audience, as a congregation, and exceedingly pious and well behaved I must say you all look—that is, perhaps, with one or two notable exceptions, who have caught my eye from time to time!

This being the case, however, then perhaps it might not be out of place if I quote you a text from the Scriptures. I will give you Isaiah 40th, 6th verse, which says "All flesh is grass".

Now, this is not a figurative statement, but it is literally true, for our bodies, arms, legs, eyes, faces, senses and minds are really all simply concentrated grass, for practically all that we eat comes from grass plants.

Bread, meat, milk, butter, eggs, cheese, and indeed many of the liquors we consume, are all made from grass, processed in different ways.

Bread is made from grain, which in turn is the seed of grass plants, wheat, rice, rye, millet, etc.

Livestock, which gives us chops and steaks and roast beef, butter, eggs and so forth, develop from coarse grains, in turn the seed of grass plants—corn, barley, oats, etc.; or livestock are often partly produced from the stems and leaves of the grasses themselves.

Practically all our foodstuffs, then, are really concentrated grass, processed in different ways that make food of different forms, textures, and flavours, but they are still nothing but grass at the base.

It is important to remind ourselves of the above simple fact for the reason that it will make clear to our minds why foodstuffs can so easily be substituted one for the other. The metabolism of the human body is such that it will readily assimilate grass when processed, which appears to be the natural food of all life in almost any form.

THE FOODSTUFFS OF THE WORLD

Before stating the quantities of the different kinds of foodstuffs that are produced and consumed annually in the world it might be well first to list them. The important foodstuffs, then, are as follows: rice, breadstuffs made from wheat, rye, spelt, millet; some bread from corn, barley, oats.

Next there is a group of grains usually fed to livestock to

make chops and steaks, milk and butter, etc., for us. These in turn are corn, barley, oats, mixed grains, and, of course, the stems and leaves of grass plants themselves.

As well as the above, mankind either directly or through the medium of livestock products, consumes large quantities of potatoes, fruits, vegetables, fish, game, peas, beans, and lentils. Incidentally, it may be remarked that fish live on grass plants which grow in the sea, lakes and rivers; first cousins to the grass plants which grow on the land.

It is regrettable, but a set of rather tedious figures now has to be presented. Perhaps the figures can be recited and then presented to you in a different manner so that they may be easier to remember, or at least so that the picture may be seen with less fatigue to mind and eye.

**Quantities of Various Foodstuffs Produced and Consumed
Annually in the World**

(Figures given are in round numbers from authentic sources)

WHEAT	5,600	million bushels
RICE	5,300	" "
RYE	1,900	" "
SPELT AND MILLET..	30	" "
 TOTAL	 12,830	 " "

The above grains are eaten by man, in the main, in the form of bread—incidentally one pound of these grains makes approximately one pound of bread. This is easy to remember: On the average, $4\frac{1}{2}$ bushels of wheat, i.e. 270 pounds, make 196 pounds of flour, but the 1936 pounds of flour, in turn, with the extra moisture and other ingredients make, curiously enough, almost exactly 270 pounds of bread. This is with the average baking practice in the United States and Europe.

Next we have the foodstuffs eaten in the largest quantity by mankind:

POTATOES	8,000	million bushels	..
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Next we have the grains that are, in the main, fed to livestock:

CORN	4,300	million bushels
OATS	3,900	" "
BARLEY	2,100	" "
MIXED GRAINS	200	" "
 TOTAL	 10,500	 " "

In addition to the above, however, there are certain quantities of other agricultural products, fed to livestock, such as rapeseed, ground nuts, linseed, sesame, cotton seed, hemp seed, copra, palm kernels, peas and beans. Inasmuch, however, as a large proportion

of most of these products are processed for industrial use it is not possible to estimate the quantities that are fed to livestock. Soy beans probably form the largest single foodstuff of this latter group of incidental products.

In addition to all the foodstuffs and grains previously mentioned, mankind consumes certain quantities of peas, beans, lentils, fruits, vegetables, flesh, game. All put together, however, form a minor quantity compared with all the foodstuffs previously mentioned.

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FREIGHT TRAIN ANALOGY

Because figures given are difficult to remember, we might present the world's foodstuff picture in a different manner, that would be no doubt reasonably correct.

Let us imagine an average freight train, which consists of 56 cars,—but here we must permit our imagination to expand,—each car holding not the usual thousand bushels of grain, but instead one hundred million bushels.

If we will assume that imaginative freight train, then freight trains would be required for different foodstuffs as follows:

WORLD'S WHEAT—1 such freight train.

WORLD'S RICE—1 such freight train, but with 53 cars instead of 56.

RYE, SPELT, MILLTT—about 1/3 of such a train, or, let us say, 18 cars.

Therefore, the cereal grains which are eaten directly by man, or in the form of bread, would require 2 1/3 of our imaginative giant freight trains.

THE WORLD'S POTATOES—1½ such freight trains.

GRAINS FED TO LIVESTOCK, including corn, oats, barley, mixed grains, and as well the incidental products—soy beans, linseed, etc., 2 such freight trains.

Perhaps for VEGETABLES, FRUIT, FISH, GAME and other incidental foodstuffs, 1 additional such freight train would be required.

Therefore SEVEN SUCH FREIGHT TRAINS would be required to hold all the foodstuffs produced and consumed by mankind in any one year, each train consisting of 56 cars, each car containing one hundred million bushels, or its equivalent.

The cereals, RICE, WHEAT, RYE, MILLET, SPELT, would occupy just over 2 of the freight trains out of the 7, wheat alone occupying 1.

PER CAPITA CONSUMPTION

There is another method of presenting the picture that perhaps may be even simpler.

THERE ARE APPROXIMATELY TWO THOUSAND MILLION PEOPLE IN THE WORLD.

These people consume, on the average, for all purposes, the equivalent of 18.5 bushels of foodstuffs, per head, per annum. (This includes the requirements for seed to produce the succeeding crop).

Of the 18.5 total bushels	WHEAT represents	2.8 bushels
	POTATOES	4 "
	RICE	2.6 "
	RYE, MILLET AND SPELT	1 "
	CORN	2.1 "
	MIXED GRAINS AND OATS	2 "
	BARLEY	1 "
FRUITS, VEGETABLES, PEAS		
BEANS, LENTILS, FISH		
GAME AND INCIDENTAL FOODSTUFFS		3 "
	TOTAL	18.5 "

Now, it will be observed that of all the foodstuffs produced wheat represents about 1/7 of the total. Actually, however, wheat represents about 1/5 of the total of the food as it appears on man's table, for the reason that the 10,500 million bushels of coarse grains, that we have noted as being fed to livestock, only produce ready for consumption, about the equivalent of 2,000 million bushels of livestock products—meats, eggs, butter, cheese, etc.—for the reason that it takes 5 bushels of grains, on the average, fed to livestock, to produce the equivalent of 1 bushel of livestock products, or, to put it in the terms used by livestock men, about 5 pounds of grains to make a pound of meat or other products.

Therefore, actually, the people of the world consume on their tables not 18.5 bushels of foodstuffs, per person, per annum, but actually only 14.5 bushels, in a concentrated processed form, and wheat accounts for 2.8 bushels of the 14.5, or about 1/5 of the world's foodstuffs in the form usually eaten today.

HUGE CEREAL RESERVES AVAILABLE

There is an important lesson to be learned for us all in the fact cited, that it takes 5 pounds of grain to make one pound of meat, when we realize that the 1 pound of meat, or eggs, or butter, or cheese, is not much more, if any more, nourishing than one pound of good bread; and we have already learned that approxim-

ately one pound of grain will make one pound of bread. (This is not quite as true with oats and barley as it is of wheat or rice, but it is approximately true).

It is apparent, therefore, that if the world cared to live upon breadstuffs almost entirely, and to abstain from consuming those livestock products fed on grain alone, or partly on grain, then the 10,500 million bushels of corn, oats, barley and mixed grains, which now in the world are fed to livestock, and which now produce only 2,000 million bushels of foodstuffs in the form of livestock products, would actually produce almost 10,000 million bushels of foodstuffs, in the form of bread, or almost five times as much.

Thus we see, and this is the important point to remember, that the world actually has each year an enormous reserve of foodstuffs at hand consisting of, let us say, about 6,000 million or 7,000 million bushels of coarse grain. This could easily make the same weight of palatable bread for mankind, upon which people could subsist and even thrive if necessity ever drove them to use the grains in this fashion.

Large numbers of people in the world, even today, live on barley meal, corn meal, and oat meal, so that it can, at a pinch, be done. It is apparent, therefore, that a possible shortage of a few hundred million bushels of wheat, let us say, in the world, or even of a few thousand million bushels of wheat would not necessarily mean that large numbers of people would starve. For in the event of such a shortage, the large quantity available of coarse grains could be made into foodstuffs directly for man instead of being turned into livestock products.

There are some countries in the world, notably China and India, where the population per square mile is so great that for centuries, perhaps for thousands of years, they have been unable to afford the luxury of using so much grain to feed livestock—they are obliged to subsist mainly upon the grains and the plants that are produced by the land in as direct a form as possible.

Should the population of the world greatly increase per square mile, no doubt the whole world in time might be driven to this manner of feeding itself.

It is only very wealthy countries, which comparatively speaking are thinly populated, that can afford the luxury of processing grain into meat and into other livestock products.

PEOPLE CAN ABSTAIN

While it is true that whenever people can afford it they delight in varying their diet, and in living upon foodstuffs in a very concentrated form that are palatable, still it must not be forgotten that at a pinch man can live mainly upon grains alone, for many have to do so now. Also, we must remember, that most of us, for a considerable time at least, can live upon much less foodstuffs, per day, than we are in the habit of consuming. The experience during the war, in European countries, showed this to be true, for while the people of Great Britain, France, Germany, Italy and other countries had their rations cut almost in half, as compared with the usual quantities they consumed in peacetime, yet it is recorded that the people never were so healthy, and the doctors never had so little to do.

Considering all that now has been presented, i.e. the vast quantities of varied foodstuffs available to mankind in the world each year, the great reserves that are available in the form of coarse grains should necessity drive, and as well the astonishing ability of at least the people of our Western civilization to get along with less food per day, then we no doubt can clearly see how foolish it would be for any group of persons, or for any government, to withhold one grain or foodstuff from the market with the hope of making the people pay a higher price for it.

The truth is that people can easily do without large quantities of any single foodstuff—they can easily substitute. At a pinch they can do with less. This is the agelong weapon that that “forgotten man”, the **consumer**, the average working man’s family, and the housewives, have ever used to defeat the aims of those who attempt to control the price or the flow of any foodstuff. The buyer, the consumer, the housewives, always win,—they abstain from purchasing the planned product, hence surpluses pile up and in time the surpluses crash price. Thus the buyers, the consumers and the housewives, purchase at their own figure in the end.

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TENDENCIES FAVORING FARMERS

These observations may be considered to be pessimistic but they should not so be regarded, for there are fundamental forces and tendencies at work in the world favoring farmers. One of them is, as already stated, that under normal circumstances, when foodstuffs are free to flow without interference, either of price or quantity, and when the antagonism of buyers, consumers and

housewives is not aroused, people like, if they have the choice and can afford it, mixed diets. They do not like to eat bread alone—they like more and more meat and butter, eggs and milk, and cheese, in many different and palatable forms. As the purchasing power of the people of the world gradually increases—and the longtime trend shows that this increase is continually taking place—so there will be a tendency to consume more livestock products per capita. So more and more grains will be required to be grown for livestock feed, in order to produce more livestock products to feed the same number of people.

This means, in addition, that much land, perhaps some that is even now in wheat, will tend to be taken out of wheat and put into coarse grains. So all farmers, the wheat growers included, will benefit as the purchasing power, or scale of living of the people of the world, increases.

There is still an additional force working in favor of farmers, which is, as already briefly stated, that there never has been produced in the world a sufficient quantity of food for the real needs of **all** the people in the world. There probably never has been a single year when millions of people somewhere or other in the world have not died, either directly from the lack of food, or from malnutrition, due to the lack of sufficient proper food. One has to have lived in or visited such countries as China and India to see the great need that exists with some 700 or 800 million people—not far short of one-half of all the people in the world, for more and better food.

Some day plans will be worked out by which these people will be enabled to have made available to them a larger quantity of food. Farmers, of course, then will be required to produce larger quantities.

THE PLACE OF WHEAT IN THE WORLD'S FOODSTUFFS

As already stated, 1/7 of the world's total annual production of foodstuffs consists of wheat, or some 5,600 million bushels, filling one of our imaginative freight trains of 56 cars, each car holding one hundred million bushels.

CANADA'S PROPORTION

Canada contributes to the 5,600 million bushels an average of 400 million bushels, or about 7% of the annual total, or fills 4 of our imaginative freight cars out of the train load of 56. (We are figuring an average yield per acre of 16.5 bushels for Canada on the present acreage of just over 23 million acres.)

QUANTITY OF WHEAT MOVING OVERSEAS FOR EXPORT TRADE

The bulk of the 5,600 million bushels of wheat produced and consumed annually actually does not move very far. Most of it goes from the farmers' fields only to the farmers' homes; some of it from the farms to nearby villages, towns and cities.

A very small portion of the total eventually moves from farmers' fields overseas to different countries.

The quantity moved overseas, for export, last year, was 540 million bushels, or approximately 10% of the world's total production, or about $5\frac{1}{2}$ of our imaginative cars out of our trainload of 56 cars.

CANADA'S SHARE OF THIS EXPORT TRADE

Canada's share of the trade for last year was 165 million bushels out of the 540 million total, or 30%, or Canada exported 3%, only, of the world's total annual production of wheat. Or, in another way, Canada's total export wheat would occupy about $1\frac{2}{3}$ of our imaginative cars out of the 56 in the freight train. (For those who are interested, Canada, for the average of 5 years prior to 1929, exported 309 million bushels of wheat annually—3 years ago this dropped to 265 million bushels—2 years ago to 195 million and last year to 165 million bushels. This year, so far, from Aug. 1st to the end of October, Canada's exports have been even less than they were for the same period last year).

LESSONS TAUGHT BY FOREGOING SUBJECT MATTER

1. That the world produces and consumes, each year, a vast quantity of different kinds of foodstuffs, most if not all of which are easily substitutable one for the other whenever price dictates.
2. That the housewives of the world unconsciously, instinctively and eagerly, hour by hour, purchase the largest quantities of the foodstuffs that are cheapest and abstain from purchasing foodstuffs that are relatively dearer, or that are not such good "buys".
3. That wheat, while a most important part of the world's food, is not necessarily the most important. Untold millions of people in different countries thrive who have never tasted wheaten bread—others consume but little of it, and every human being, without doubt, could easily live without it if other foodstuffs were available, and for the most part they usually are available or quickly could be made available if required.

AN ACTUAL INSTANCE OF FOOD SUBSTITUTION

In 1925 flour and bakers' bread in central Alberta were very dear. The writer had a staff on his farm, and a family, which required a considerable amount of bread each week. Bread was purchased from the baker in a nearby town. It was discovered that 100 pounds of rice could be imported from Shanghai, China, and laid down on the farm table cheaper than 100 pounds of wheaten bread, so rice was fed in large quantities to the staff and the family instead of bread. This, be it remembered, was in the centre of certainly one of the best wheat-producing districts in the world, and where, moreover, wheat was actually being produced at a very low cost of production. If, therefore, a wheat farmer finds it cheaper to use Chinese rice than bread made from his own wheat, and did so, it is easy to see how readily housewives in large cities can substitute one food for the other when they have the foodstuffs of the world available to them each day in the stores of the cities.

4. In spite of all that has been shown of the vast quantities of the foodstuffs in the world, we learn there are so many people in the world that, on the average, people are insufficiently fed, particularly with respect to a diversity of foodstuffs.

The League of Nations recently issued a publication entitled "Nutrition and the Public Health". It indicates that large numbers of people, even in our Western civilization, are really under-nourished, and that one of the important necessities in the world is "To produce more food".

5. If the above statement by the League is accepted as true, and most competent observers consider it is true, then it is self-evident that whenever surpluses of wheat or other foodstuffs pile up in any one country, there must be large numbers of people in other countries who are in great need of those surpluses. It is further evident, therefore, that distribution must be at fault.
6. A careful analysis of the conditions under which surpluses have actually piled up convinces one that there is but one cause for such a condition, which is that either price, which is the great governor for the distribution of foodstuffs, or that distribution itself has been arbitrarily interfered with. For there is no evidence whatsoever that any surpluses ever piled up in any country when the movement of foodstuffs was performed by merchants through free and open markets without hindrance from Governments.

7. The above conclusion leads to the conviction, therefore, that perfect distribution of foodstuffs, from those who produce them to those who so badly need them in the countries of the world, will once again take place—as it did in the past for so long—when large numbers of merchants in every country are permitted, without hindrance or interference, to press these foodstuffs on the markets of the world in competition one with the other, and at prices which are in accordance with the purchasing power of the people.
8. One seems justified, then, in concluding that it is not true, as stated by some, that the system of distribution has broken down, but rather that the distribution of foodstuffs is not permitted to function properly because of the action and interferences by Governments, by means of quotas, restrictions, depreciation of exchanges, restriction of imports and unreasonably high tariffs.
9. Due to the determination of housewives to insist upon purchasing the cheapest foodstuffs that will satisfy the table of their families, then it is self-evident that any attempt to hold a single grain or foodstuff such as wheat, for instance, from the market, with the hope of obliging buyers to pay eventually a higher price for it must be doomed to failure. Buyers instead of purchasing at a higher price, merely use other foodstuffs which are cheaper. Inevitably a surplus of the planned, or price-governed, product must then pile up, and the accumulated surplus, in the end, falls of its own weight and crashes price lower than otherwise it would have been. All this is accompanied with loss of markets to the producers and loss of money to taxpayers and others.

During the past thousands of years there are accurate records of numbers of attempts that have been made with literally hundreds of products and commodities to control production, supply and price. Without exception all these attempts have most dismally failed. There is no record of any single attempt having ended in anything else than complete disaster. If any people have any doubts about this they should read and study a report just recently issued on the "Activities and Operations of the Federal Farm Board—and of the U.S.A. Wheat and Cotton Stabilization Operations". The report is No. 1456, presented by Mr. McNary, and can be obtained from the U.S. Government Printing Office, Washington. I have also been able to accumulate and compile the records of a large

number of these attempts that have been made during the past 4,000 years. They all failed.

10. COMPARISON BETWEEN OPEN MARKETS AND PLANNED OR STABILIZED CONTROL.

For 80 years, between the Napoleonic Wars and the start of this last war, 1913-14, the handling and marketing of wheat between producer and consumer by merchants, through the free and open market system of competition, without interference by Governments, brought about during that period the following results:

- (a) It sold all the foodstuffs that were produced each year in almost every part of the world without the piling up of any surpluses.
- (b) It returned to the producer, on the average, over a term of years, better than his cost of production and afforded him a reasonable scale of living or reward for his efforts. Very frequently the returns and profits made enabled untold numbers of farmers to accumulate capital and wealth in the form of farm buildings and equipment, in addition to providing the necessities and some of the amenities of life.

Frequently, indeed perhaps in millions of cases, such wealth and capital was built up by many persons who came to the Western part of the United States and Canada, without any financial resources whatsoever, and without any previous experience of farming, and moreover, came, for the most part, from humble and modest circumstances in the countries from which they emigrated.

- (c) It provided foodstuffs to the people of the world at reasonable prices and in bountiful quantities.
- (d) It did all this by taking but a trivial toll per bushel, or per pound, of the product handled, from either producer or consumer.

Since 1929, however, the movement of foodstuffs, particularly of wheat throughout the world, has for the most part been restricted and controlled by Governments and some other institutions. In many instances attempts have been made to "stabilize" price. Let us see how the wheat business has fared since 1929 to date in comparison with what the free and open market did for the industry, as outlined in previous paragraphs.

We find that for the five years prior to 1929 Canada's average annual export of wheat to the countries of the world amounted to 309 million bushels. We find after a certain time of price and distribution control, and more particularly of price stabilization,

that three years ago Canada's sales had dropped to 265 million bushels for the year, that two years ago a further drop took place down to 195 million bushels for the year, and that last year the export was only 165 million bushels, and that this year, from Aug. 1st to date, exports are some 6 million bushels less than they were during the same period last year, which was the smallest year on record since 1920. Moreover, under this condition of so-called price stabilization, an enormous surplus of over 200 million bushels of unsold wheat has piled up. (Canada's normal surplus under the free and open market was around 40 million bushels, which is the proper amount.)

Under this planned system, moreover, the millers of the world have been induced to experiment in their laboratories so that they have discovered ways of making acceptable flour, with a much less percentage of Canadian wheat than hitherto they thought possible. Therefore, markets have been lost, some part of which will never be remained, although some part of the lost markets could be won back, no doubt, with aggressive sales' methods.

CONCLUSION

Age-long records, going back thousands of years during the times of the Assyrians, the Persians, Egyptians, the Greeks, the Romans and through the Medieval Ages up to modern times, reveal beyond any question of a doubt that the moving of foodstuffs from farmers to the people of the world is governed by definite, immutable, inexorable and irrevocable laws, or principles that function automatically through the workings of what are called the fundamental principles of economics. These, in turn, are merely the recorded behaviour of human beings in the mass, and the behaviour of human beings, in the mass, under the same conditions, century after century, has been found never to vary—thus such recorded behaviour becomes a principle or law.

The accumulation of an excessive surplus of wheat, or any other foodstuff in Canada, or in any other country, has never been due to accident or to bad luck, but has ever been simply the inevitable result that has occurred in the past, and is bound ever to occur in the future, of artificial interferences with price and with the laws and principles of "supply and demand".

So long as the flow of foodstuffs is interfered with by restrictions, stabilization and by other means, so long will proper distribution be curtailed; hence surpluses will pile up, hence vast numbers of people in the world will necessarily have less food available to them than they need. These results are as certain to

occur as the sun is to rise and to set, the simple reason for it all being that no one man, or no small group of men, attempting to control price or supply, or distribution, have either the knowledge or the wisdom to know the proper price to ask for a foodstuff, nor can they possibly know when to sell and when not to sell; on the other hand, the open market functioning through the medium of tens of thousands of merchants, in all the countries of the world, ever from minute to minute adjusts itself automatically to the supplies available, to the needs of the people, and to the limits of their purchasing power.

Price, working through the fundamental urge to make a good profit—to avoid a loss—to make income stretch as far as it will go—is the only force that will increase or decrease **demand**—is the only force that will increase or decrease **acreage in crop**, or **production** of any one crop.

It is perhaps a truism to state that all the plans that man can make, laws—regulations—restrictions—regimentations and coercions—are feeble and of little account compared with the force—pressure—and fair-regulating power of **FLUCTUATING PRICE** which can be said to be the great balance-wheel of our economic life.

QUESTIONS AND ANSWERS

Question 1—How do you obtain the statistics about Russian wheat production?

Answer—Statistics from Russia are not considered to be as accurate as those from Canada, although of recent years Russian statistics have been thought to be reasonably accurate.

Russia is the second largest wheat producer in the world, averaging for the last few years about 850 million bushels per annum, the largest wheat producer being China, which is considered to produce about 950 million bushels per annum, as estimated by the Directorate of Statistics, National Government of China, Nankin. This year, however, we are told by the Russian statisticians that that country has produced the largest crop in her history—perhaps as high as 1,000 million bushels. Some authorities consider Russia will export large quantities this year,—on the other hand the Soviet Government has withdrawn all restrictions upon the use of bread; it can be expected, therefore, that per capita use of bread will increase, and will certainly use up a good part of the extra production. Only time will tell how much Russia will export this year. The increase in population, in Russia,

since 1916, is the largest percentage of any country in the world. Even with her wheat production of 1,000 million there would be less wheat available per person than the Russian people had in the days of the Czar.

Question 2—Do you think Canada's decrease of sales of wheat since 1922 may have been due to lack of advertising our wheat?

Answer—In my opinion the decrease in Canadian sales has been clearly due to two separate and distinct causes:

- (a) To the fact that the world's trade in wheat decreased between 1929 and 1935 by 31%. Canada, therefore, might well be expected fairly to have suffered a decrease of 31% in her sales, although some think that her decrease should have been less. Due to the fact that the United States had withdrawn from the export market, some persons consider Canada should have won some of the United States' export market. But be this as it may, Canada's exports dropped not 31% but 46%, and the difference between these two percentages of loss of sales was due to:
- (b) That the price of Canadian wheat, under stabilizing operations, was held at too high a price above competing wheats—Argentine and Australian—on the markets of the world. Therefore our competitors' wheats were at all times better "buys" for the millers.

The hope for Canada, in my opinion, is that as "self-sufficiency" and "Nationalistic" policies are abandoned in the world, and replaced by a policy of what might be termed "ECONOMIC LIBERALISM"—which means the reasonably free flow of goods between countries,—then the movement of goods and commodities between countries will increase, bringing in its train an increase in the movement of wheat.

Then, as far as (b) is concerned the recovery of lost trade will require an aggressive selling policy on the part of Canada to make her wheat as good a "buy" or perhaps a better "buy" for the millers of the world than competing wheats. I feel sure that this can be done if aggressively pursued. Some day it is certain that if Canada wishes to remain in the wheat industry we shall have to "go to the mat". so to speak, with our competitors. If we fail to do this, some day we will waken up and find that the world has learned to make bread without Canadian wheat, just as was done for hundreds of years prior to the year 1877, when the first shipment of wheat from Western Canada, direct to Great Britain, was made. The world likes Canadian wheat, and is willing to

purchase it, but only at competitive prices. We are simply deluding ourselves if we think we can force them to pay more than its value in comparison with the price of competing wheats which they can purchase.

Question 3—Do you think if we advertise our wheat we can sell more?

Answer—I think the first step to be taken is to offer our wheat for sale on the markets of the world at prices at which it can compete with foreign sorts. I am not competent to say whether advertising, after this, would bring in additional sales. We must remember that the question of the advisability of advertising Canadian wheats is a very old proposal. The Hon. Mr. Motherwell, Minister of Agriculture, about, I think, if I am not mistaken, the year 1925, formed a special committee to study this matter. As far as I know, nothing came of it. Then the Hon. Mr. Stevens, in the year I think 1931, when he was Minister of Trade and Commerce, had a special investigation made to consider the suggestion of establishing Canadian bakeries in the important towns of the British Isles, so as to demonstrate to the British people what bread made from Canadian wheat was like. Nothing, however, came of this either.

Mr. N. L. Leach, President of the Searle Grain Company, at the Regina Grain Conference, Regina, 1933, publicly made the same suggestion. Nothing, however, came of this.

It must be remembered in this connection that Canadian wheat is not used in Europe to make a loaf of bread. It is used in small percentages, varying from 5% to 30%, as a rule, though in Scotland in much larger proportion, to make the loaf lighter, to make it rise, and when it has risen in the oven to make it stay risen and light; in other words, Canadian wheat is used in small percentages to make a loaf made from native wheats more palatable. On the whole, European people do not seem to like bread made from all-Canadian wheat. They think the bread is too light, too full of holes, and the crust too hard, and that it lacks the sweet nutty flavour of the British and other European breads.

It would appear, therefore, that any advertising campaign would have to confine itself to showing, if it contained an admixture of Canadian wheat, how a loaf made with native wheat would be more appetizing and more palatable. Certainly, if this could be brought about, an increase in the per capita consumption of bread would occur. With it all, however, any advantage that might be gained by advertising would be lost instantly if the price of our

wheat were to become out-of-line. Even at this moment, as I speak, the price of Canadian wheat at Liverpool, our No. 2 Northern, is 6 cents a bushel higher than the best Australian—now our chief competitor. Millers consider this spread is rather too wide, and that at the price Australian is the best "buy", and not Canadian.

Question 4—You did not mention anything about Soy beans? Are they not an important foodstuff?

Answer—Soy beans in some countries are an important product. Unfortunately no very accurate statistics are available as to the amount that is used for human food, or for feeding to animals. Large quantities are used for the manufacture of oil, appetizing sauces, other industrial uses, and some proportion is used for the making into flour for Soy bean bread, and some proportion is used for making into Soy bean oil cake, which is fed to animals.

Soy beans are noted as being the one product of the land which is processed into a greater diversity of products than any other. If wheat could be processed into as many products as the Soy bean, this Winnipeg Grain Exchange would have to be greatly enlarged to accommodate the vast quantity of wheat that would be handled by its members.

I really should have dealt in more detail with Soy beans in my paper. I thank the gentleman for drawing the matter to my attention.

FURTHER COMMENTS ON SOY BEANS

In looking up the statistics of Soy beans supplied by the International Institute of Agriculture, I find that they are grown in Austria, Russia, the United States, China, Manchuria, Korea, Formosa, the Dutch Indies, Java, Japan, Sakaline, and Kwantung. A very rough estimate of the annual production, not including China, from which country there are no statistics on Soy beans, is estimated to be around 200 million bushels per annum.

Question 5—What are the prospects of increased sales of malting barley from Canada?

Answer—We are inclined to have a rather exaggerated idea of the possibilities for Canadian malting barley on the markets of the world. Actually, I believe, six or seven million bushels would be the utmost limit of this for Great Britain. Last year we sold large quantities at good premiums to the United States for manufacture into beer. As the income of working people of the world

increases, so is there a tendency for them to drink more beer. There should, therefore, be a tendency for Canadian sales to increase to Great Britain—perhaps in some years to some small extent to the United States.

Canada has two reputations for grain on the markets of the world. She produces the **highest** quality wheat in the world and the **lowest** quality barley. This is due to the fact that barley is only a side line with us. If we paid as much attention to barley production for malting purposes as we do to wheat, we could greatly improve both quality and production of malting barley, although we never shall be able to compete with the world's best malting barleys, due to climatic reasons. The best malting barleys are produced by California, Hungary and one or two other countries. Canadian barley is very mixed—numbers of farmers think they are growing good malting barley when actually they are using a very poor variety. O.A.C. 21 is the best six rowed malting barley—Canadian Thorpe and Hannchen the best two rowed. On account of barley being used in the main as a crop to clean up land from weeds, it usually contains a large quantity of wild oats and other weed seeds, which naturally lowers its attractiveness to buyers, and as well lowers the profit to the producer.

Question 6—Are there any areas in the west where good malting barley can be grown?

Answer—Yes, there are. As a rule areas which for certain reasons—richness of soil, abundant rainfall, and being situated in the park or wooded areas,—are able to grow large yields of wheat to the acre, usually produce a lower quality of wheat than areas of poorer soil which often suffer from lack of rainfall, but the same areas which produce a lower quality of wheat are capable of producing the very highest quality of malting barley, for the reason that while wheat at its best should have high protein, the best malting barley requires low protein.

Question 7—Would not, however, farmers in the special areas make more money growing wheat than malting barley?

Answer—It is a question of “supply” and “demand” with both of the grains. Over a term of years certain areas in Northern Alberta, Saskatchewan and Manitoba will probably bring in a greater profit to the farmer, with malting barley than with wheat, although individual years might be quite different.

Discussion about the quality of barley is interesting, for it brings up a point that is uppermost in the minds of most students of crop production, which is that the barley crop is very difficult to

improve. In the main, it consists of mixtures of varieties, of strains and off-type. These are not as distinguishable one from the other as the different varieties of wheats, for instance. Therefore, the elimination of unsuitable varieties and strains is a much slower business with barley than is the case with wheat.

I would estimate that per bushel produced, malting barley has had many times the amount of discussion and attention paid to it than wheat. Two excellent organizations have for years been attempting to improve the quality of malting barley—The National Barley Committee and the Manitoba Barley Committee. I see in this very audience in front of me many grain men who for years past have unselfishly devoted a generous amount of their leisure time, and no doubt some money, in sitting as members of the committees mentioned, and in other ways endeavoring to assist in improving the quality of Canadian barley. Some progress is being made but it is a very slow business. For years the Trade Commissioners in Great Britain, and a special representative of the National Barley Committee, have been keeping in touch with British maltsters' requirements, but the great stumbling block with barley, as it is with many other products, is the undeniable fact previously mentioned that at the best, in the main, barley is a side line with us in Canada, and is not a main crop. Perhaps no substantial improvement will be attained until certain farmers begin to specialize year in and year out on the production of malting barley, or indeed on the production of good feed barley, for which there is perhaps a much larger market both in Eastern Canada and abroad if the right quality can be produced and offered at a competing price.

ADDITIONAL COMMENTS ON MALTING BARLEY

I should have stated in my answer, but I did not, that the reason for the good sales for the last two years of malting barley to the U.S.A., at good premiums, was simply due to the poor crops of barley, due to drought in the U.S.A. Under normal conditions the U.S.A. can be expected more than to supply its own requirements, and in addition to have some barley to export.

Question 8—What is the average consumption, per head, of wheat in Canada, and in some other countries?

Answer—The consumption of wheat in the form of bread varies greatly in different countries. I think in Canada it is about $6\frac{1}{2}$ bushels per annum, in the United States about $4\frac{1}{2}$ bushels, in

France about $7\frac{1}{2}$ bushels, in Italy about 7 bushels and in Germany about $2\frac{1}{2}$ bushels.

ADDITIONAL COMMENTS ON QUESTION No. 8

The following table shows more accurately the consumption per head of wheat, rice and rye for certain of the important countries of the world. Figures for countries not given will range in between the figures quoted for the different countries. In the table the highest and lowest consumptions are noted:

ANNUAL CONSUMPTION OF WHEAT, RICE AND RYE
IN BUSHELS—PER HEAD

Country	Wheat	Rice	Rye
France	7.5	—	.7
Canada	7.4	—	.7
Belgium	7	—	2.6
Italy	6.9	—	.2
U.S.A.	4.8	—	.3
Netherlands	4.2	—	2.3
Spain	5.6	—	.7
United Kingdom	5.8	—	—
Russia	4.2	—	4.4
Poland	1.9	—	6.2
India .....	.9	3.9	—
Japan .....	.7	6.7	—
China	1.9	3.7	—
Egypt	3.2	.7	—

(Above figures taken from estimates made by the U.S. Department of Agriculture, Bureau of Economics, Washington, D.C.)

Question 9—Do not wheat exports from certain countries depend upon price?

Answer—Yes, as Sir Abert Humphries, representing the Irish Millers' Association, told us at Regina in 1933, whenever price rises above a certain limit it is astonishing to find from what a number of countries wheat will start to flow to the world's markets. It goes from countries which normally neither export nor usually import wheat. They sell the higher priced wheat and live themselves upon cheaper substitute foodstuffs. This is one of the ways in which the principles of "supply" and "demand" function to correct shortage of any one foodstuff.

Question 10—How does the increase of population in the world agree with the increase of wheat acreage or production?

Answer—Up until 1928 from the year 1885, there was a most exact agreement, both increasing at a rate of about $1\frac{1}{2}$ per cent. annually compounded. Since 1928 there has been little if any increase in either wheat acreage or total world's wheat production,

but population has continued to increase to the extent of about 1% per annum. The trouble has been, however, that the depression has lowered incomes and has made so many persons unemployed that the per capita use of wheat has sharply declined since 1928. People who are unemployed eat less, particularly of bread, than those who are working. The French have a proverb "Qui dort dîne", meaning that a good sleep is as good as a meal, and unemployed have lots of time to sleep. They also have a proverb that "basking in the sunshine is as good as a hunk of bread", and unemployed have lots of time to bask in the sunshine. The German delegate to the first international wheat conference stated that if Germany only had normal unemployment she would be using 33 million bushels of wheat per annum more than she was doing. One hope for the wheat grower is, therefore, that as unemployment decreases throughout the world, demand for wheat and bread will increase. Another great hope is that world population is steadily increasing at the rate of 1% per annum. This alone requires over 50 million bushels more wheat to be produced each year.

Question 11—Will you tell us something about Russian agriculture, with particular reference to:

- (a) The quality of the wheat they are producing, and
- (b) The quantity they are raising?

Answer—(a) The quality of the wheat produced around the Black Sea in the days of the Czar was considered to be the highest quality in the world, and was quite as good as the best Canadian today. We must remember that perhaps the ablest plant breeders in the world, and some of the best and most elaborate plant breeding establishments are to be found in Russia. This was true in the days of the Czar just as it is today. The Soviet has carried the good work along to date. There is hardly a wheat produced on the North American Continent that has not in it some blood of a wheat originally produced by a Russian plant breeder in Russia. This refers to our best Canadian wheats and best American wheats, both spring and winter.

The Soviet Government has a great advantage over us in the way of crop improvement. Our plant breeders can produce high quality varieties and can then recommend their use for certain districts. After this is done our farmers please themselves whether they will use the right variety in the right district, or whether they will not. In Soviet Russia the Russian plant breeders similarly produce superior wheats and other grains, and decide

the districts for which those wheats and grains are best suited, but instead of advising farmers as we do, the Soviet Government **commands**, and exacts immediate obedience. Farmers there who do not carry out instructions in this regard soon find themselves out of farming and in very severe trouble.

We can expect the quality of Russian wheat to improve. It is not today as good as it was in the days of the Czar, for the reason that today the different qualities are not kept as separate as they used to be. Today there is a tendency to mix together good, bad and indifferent wheats. In time, however, no doubt this defect will be remedied.

I am personally not afraid of Russian competition in quality, for what their plant breeders can do, ours can do also, and our whole wheat area of Western Canada is much more suited to the production of hard red spring wheat of superior quality than is, let us say, all the wheat area in Russia. We shall always have a better chance of keeping our grades and qualities separate than they have in Russia. Today Canadian quality is undeniably higher than Russian. Russia will unquestionably bring about improvement in quality and handling. At the same time Canada has room for improvement also. Tests made under the "Crop Testing Plan" reveal that at least 42% of our wheat growers are not producing as high quality a crop as they should, and they can easily make substantial improvements. As the Russians progress, so shall we in Canada.

(b) With respect to quantity of production, for several years past Russia has produced around 850 million bushels of wheat. This includes spring and winter wheats. This year they have a larger acreage than ever, estimated to be about 92 million acres under wheat, and it is said that their crop will be over 1,000 million bushels. How much will they export? This is not known, for Russia during this last year has removed restrictions against the free use of bread. People are no longer rationed. Their population has increased greatly since 1916, and it no doubt is safe to say that today there is no more, if as much, wheat available in Russia, even with her large crop, per person than there was in the days of the Czar.

The Soviet has greatly increased acreage under wheat, but in order to do this some areas have been broken and put into wheat that were thoroughly surveyed by the plant breeding institutions under the Czar, and which were then considered to be unsuitable

for wheat production at a profit. In other words, the expansion of Russian wheat acreage has been into areas which correspond to the driest districts, with the poorest soil that we have in Western Canada, that are found typically in southeastern Alberta and southwestern Saskatchewan. In addition to climatic difficulty, much of Russia's new acreage is a very long way away from adequate rail and sea communication. The increase of population taking place in Russia will probably more than take care of all the wheat Russia can raise with the exception that in a very favorable year such as occurred in 1930-31, when she had an extraordinary crop, she may have some wheat for export. This, however, it does not seem will be the rule.

To those who are interested in Russian agriculture, I can advise that they should secure copies of the dispatches to the Winnipeg Free Press, written by Dr. E. Cora Hind, who has recently made a personal investigation of Russian farming. The articles are extremely informative and illuminating, for Miss Hind is probably the ablest agricultural observer and writer who has ever visited Russia. Her articles are timely and well done indeed.

Question 12—What percentage of export wheat trade goes to the Orient?

Answer—It varies. Wheat exported to ex-Europe is about one-quarter as much as that which goes to Europe.

Question 13—How much Canadian wheat goes to the Orient? (China and Japan.)

Answer—I cannot carry these figures in my head, but to the best of my recollection it would be a minimum of about 5 millions and a maximum of 40 millions in different years. Canadian exports vary greatly.

Question 14—What would be the percentage of Canadian wheat of that trade? Not the bushels themselves.

Answer—I should think the percentages would be very close to the same figures, that is a minimum of 5% and a maximum of 40%.

**COMMENTS ON THE ABOVE QUESTIONS AND ANSWERS
AFTER CONSULTING PUBLISHED STATISTICS**

Canada's smallest year appears to be 1933-34, when Canada exported 1.42 millions to China, Hong Kong and Kwantung and 5.38 million bushels in addition to Japan, making a total of 6.8 million bushels to the Orient. Canada's best year in recent years

would seem to have been 1928-29, when she exported 22.47 million bushels to China, Kong-Kong and Kwantung, and 22.11 million bushels to Japan, making a total of 44.58 million bushels to the Orient.

In these two years the total exports of wheat to the Orient from all countries were 59 million bushels in 1933-34, and 81 million bushels in 1928-29.

Note: It seems that the questions asked by the member were not exactly the ones mentioned above. They were intended to be as follows:

(a) How much Canadian wheat has been exported to the Orient—highest and lowest years?

Answer—The answer that should be given to this is the same as under “Comments” above.

(b) What was the percentage of Canadian exports sold to the Orient—Highest and lowest year?

Correct answer to this question is, that in 1928-29 Canadian exports to the Orient were 11% of her total exports, whereas in 1933-34 Canada's exports to the Orient were only 3.5%, showing a loss of 7.5% or of just over 38 million bushels.

Question 15—Do you consider, then, that Canada has lost her Oriental market?

Answer—During the last few years Canada has lost wheat markets everywhere, and appears to have lost them in the Orient to a greater extent than in Europe.

COMMENTS ON THE ABOVE ANSWER

In 1928-29 Canada had a low grade crop which was able to be sold cheaply. Low grade Canadian wheat can be used to good advantage in Oriental countries. This accounts for the large sales in 1928-29. Canada's average sales, however, can be said to be at least over 20 million bushels to the Orient, so that even from the average, the sales in 1933-34 of only 6.8 million bushels in itself shows a substantial loss, due, no doubt, in the Orient, as it has been in Europe, to the fact that Canadian wheat was held at too high a price on world markets as compared with competing wheats.

Question 16—You mentioned difficulties of foreign countries obtaining Canadian exchange with which to buy our goods. Can you give us a definite illustration or instance?

Answer—Yes, I can. About two years ago the little country of Latvia needed badly some certified sweet clover seed from Manitoba. The quality of the seed was satisfactory and the price was satisfactory. Unfortunately, the deal could not be consummated because Latvia found itself unable to obtain any Canadian exchange. Exchange was rigidly controlled and rationed by the Government.

Last year, unexpectedly, payment for the seed arrived in Winnipeg in the form of a draft on New York. This, it was explained, was made available to Latvia because that country had been able to sell some rye to the United States. Thus, in reality, Latvian rye was sold to the United States for American dollars—some American goods were sold in Canada for Canadian dollars, and so the Canadian dollars were available to the Latvian people with which to pay for the sweet clover seed from a farmer in Manitoba.

Germany and several other European countries have frequently complained that they cannot buy Canadian wheat, or as much of it as they would like, because they cannot obtain Canadian exchange. They could, they say, obtain more Canadian exchange if Canada would purchase more German goods, and so make the funds available to Germany for the payment of Canadian wheat.

Finally, then, it seems that the lesson to be learned is that along one taught us over and over again by Adam Smith, the great English writer on Economics in 1776, that when any country restricts imports from other countries, at the same time it automatically restricts its own exports going out.

Question 17—You stated that while the world's export of wheat for 1929 to this last year had dropped 31%, Canada's trade had dropped 46%, and you said this was due to Canada keeping the price of her wheat high in relation to the price of competing wheats. Will you tell us whether our producers would have suffered badly had we sold more wheat at a lower price in keen competition with the other export countries?

Answer—The difference between the 31% and 46% amounted to 47 million bushels, which Canada did not sell.

It is my own firm opinion that had we pressed the extra 47 million upon the market and sold it, the price obtained for wheat we did sell, plus the 47 millions, would have amounted to more

money than we obtained for the smaller quantity we actually did sell at the higher price, or in other words, price would not have dropped as low as some think.

Another substantial advantage would have accrued to Canada had we sold freely. There would have been 47 million more bushels of Canadian wheat used in the world's mix of flour and bread, so millers and bakers would have been accustomed to the use of a larger percentage of our product. We should have held our markets better. I have always believed that it is better to sell a larger quantity of wheat at a lesser price than a smaller quantity at a higher price. Not only do the larger quantities help to give work to numberless additional people in transportation and distribution, but as well over a term of years larger sales will, I am, sure, be found to be far better for the producer. He would have retained important markets abroad for large quantities of his product, and when prices rose, as sometimes happens, due either to decreased supplies in other countries or to increase of demand, then our producers would find themselves with large, instead of small, quantities to sell at the higher prices.

Another, perhaps even greater, advantage, would have accrued had we sold freely. There would be less "carry-over" in Canada, and more of it in the bins of a dozen other countries.

Now, it is quite certain that any given quantity of a surplus of wheat, or of any other product for that matter, has a far greater depressing effect upon price when held in the bins of one country or in one hand, than if the same quantity should be in the bins of a dozen countries, and in the hands of thousands of individuals. The reason for this is that, statistically, the average future actions of a thousand individuals can be forecasted, whereas the future actions of one or two men, or of one Government controlling a large surplus, cannot be forecasted. In the latter case merchants are frightened, buy only reluctantly, and are induced to purchase eagerly other countries' wheats.

There is still another point. It is possible that any given quantity of surplus wheat in Canada, in any case, depresses price more than the same quantity elsewhere, for the reason that wheat is kept in most excellent condition always in our splendid terminal elevators, and Canada maintains a corps of men who measure the wheat weekly and who issue to the world accurate statements about it.

Under these circumstances the buyers of the world, millers and so forth, are not at all fearful about where they can obtain their supplies. They know there are vast quantities available for them when they need it in Canada, all being well-cared for at the expense of Canada. Why should the millers of the world stock up their bins and pay for storage if Canada is willing to carry the stocks and at her own expense?

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I would say, finally, that there will be no relief in its true sense for the Canadian producer until the large Canadian surplus is reduced to a normal "carry-over" of between 40 and 50 million bushels. When this occurs a sound foundation will be laid for remunerative prices to wheat producers in Canada and in other countries, and as well will Canada then be able to command her rightful share of world export sales, because there will be no reason why she should not actively compete with other countries. It will be found also, I am sure, that in the long run the price that will be returned to the producer will be a fair one and will afford him a decent and proper scale of living; but the free and open system of marketing by countless merchants, without undue Governmental interference with either price or distribution, is the only method of which I know that can bring about this most desirable condition for our wheat producers and for all of us.

THE FUTURES MARKET AND THE PLACE OF SPECULATION AND SHORT SELLING

Mr. Chairman and Gentlemen:

The subject allotted me tonight, "The Futures Market and the Place of Speculation and Short-Selling", is a very important, very interesting but very big subject. Except in a merely summary way, which would not prove satisfactory, it would not be possible in one evening to attempt to cover the whole field of this subject. With your permission, therefore, I propose that we should talk tonight first about the beginnings of futures trading, its origin, its essential character in the beginning, and then that we leap over much of the intervening territory to look at the ultimate results in as far as they are displayed in facts. If we could tonight arrive at some understanding of how futures trading began and what it really was, and is, and then look to the end of the operations of futures trading and see its effects, we would probably have covered as much as could be attempted on one occasion and we would probably put ourselves in the best possible position at some later time, either by ourselves or in conferences such as this, to take up the details of the operations and of the various incidental and other problems which are involved in the subject as a whole.

Before proceeding, as I have suggested, I think it would be well if we all had in mind certain of the general conditions which create problems for all business, and particularly for all modern business. I will mention only a few of these main general conditions.

THE FACTOR OF RISK

The first is the conditions which are created by what is commonly referred to as the "factor of risk", which is inherent in all business. That subject was most ably and conclusively dealt with in this hall by Dr. Alonzo Taylor, just a few weeks ago. The factor of risk creates one of the biggest items of cost that business has to meet. Now, that risk is of more than one kind. Business may risk acquiring too great quantities: it may risk having too small quantities. There is a risk of not having the quantities you want at the time you want them. But more important are the inevitable risks involved in the probable changes in price, and we all know that prices are always changing. Because of delays that must inevitably ensue between the acquiring of a commodity and its final disposition, changes of price almost certainly will

occur and if those price changes are adverse, loss must be suffered. This factor of risk may be provided against to a certain extent, perhaps to a certain extent neutralized, but for the greater part the business of the world must bear the cost of risk.

THE PROBLEM OF STORAGE

The second of the general conditions arises out of the nature of production and consumption of different commodities. There are differences as extreme in the case of wheat, probably, as in any other commodity. In Canada, our total supply of wheat for a year is gathered within six weeks or two months. That supply, insofar as we use the domestic product, must last us for twelve months, for consumptive demand is very even throughout the year. If you take the world as a whole, well over ninety per cent. of all the wheat is grown in the Northern Hemisphere and gathered, say, within four months, or one-third of the year, and yet that wheat constitutes ninety per cent. of what the world will use only in twelve months. You will see at once that among the special problems of the wheat business is a very big problem of storage, and, in connection with that, problems of ownership and finance, arising out of the conditions inevitably created by the fact that supply comes into existence within a very few weeks but must be made to spread out over twelve months.

TRANSPORTATION DIFFICULTIES

Another general set of conditions relates to transportation. Let us take conditions of transportation on the ocean. Wheat, I believe, creates more ton miles of traffic on the ocean—or on the oceans because it uses them all—than any other commodity, such as iron ores, coal, or anything else. Wheat is one of the world's biggest items of traffic. If there were an attempt to move across the ocean immediately after harvest the new supply of wheat each year, a demand would be made for ocean tonnage which would involve the use of an important fraction of the whole. Since there is an open market in ocean freights, inevitably freight rates would rise to a prohibitive level. It is economy and sound business, therefore, to use the ocean system of transportation as evenly as possible throughout the year. If not, costs would enormously increase and there would be waste of tonnage, because if the ocean were to provide a quantity of tonnage capable of carrying the peak load of wheat, that tonnage would remain idle for a good part of the rest of the year. Locally, of course, we have our special conditions of transportation. We have, for example, the Great Lakes system which is open only for a part of

the year. It is economy for us to use it when it is open, and to do that we have to adjust our movement of grain. The whole problem is to move not too fast and not uneconomically the wheat produced in a very few weeks, so that it may reach its final consumers day by day.

FINANCIAL REQUIREMENTS

Another general condition is that of finance. Try to think what would be involved if every grain firm in this building were required to have working capital enough of its own to handle the peak load of its business. There is no firm of any considerable size which would not of necessity have to have, of its own, sums running into many millions of dollars if it had to be dependent upon its own financial resources and working capital to handle its business. That, of course, would be impracticable. If anything could be done along that line, combination and monopoly would ensue. There could not be the competition there is today, and there would be a grave waste of capital, because there is only a short peak in the financial load, and much capital would, therefore, lie largely idle during all the rest of the year. To conduct business on modern lines—and the grain business in particular—it is not only wise and economic, but necessary that such business should have access to the world's common fund of working capital which consists of the savings of the hundreds of millions of people in this world, the sums being gathered and largely administered through our banks. The grain business is dependent on that money. Therefore, it is a problem for the grain business to meet the conditions on which alone that money can be obtained and which alone would justify the putting of that money at the disposal of this or any other business. You must present security for the use of that money and that is one of your problems.

There are, of course, in the conduct of individual businesses, conditions which I need not go into, because they will be in all our minds. Anyone who conducts a business of any kind must try to work out between his costs and the revenue from sales sufficient margin to make a return or reward for his own work and his own enterprise. If there is no margin he cannot continue in business, for that is his share for the values he has created. There is keen competition in all business and margins in most cannot become more than moderate. If under those conditions you must work out a margin, it is very important and very desirable that costs should be definite and known and the risks avoided.

A man in business will want to sell all he can. He will not want to build up his inventories out of proportion to the rate at which he is actually making sales. If he can, he would like to make his sales coincidental with his purchases or get someone committed to purchase from him even before he commits himself to purchase. Many other general conditions of business I need hardly mention.

EARLY GRAIN TRADING

With these more general considerations in mind as a sort of background to our problem, let us try to put ourselves in imagination tonight away back into the conditions of grain trading that existed 80 or 90 years ago, and let us take our place in imagination at Chicago. Grain trading did not differ from that at the many other grain trading centres throughout the world, but it was at Chicago the definite organization of this institution known as the futures market actually evolved.

Eighty or ninety years ago Chicago was fast becoming the largest single cash grain market in any country. The Mid-West of the United States was very rapidly expanding its agriculture and Chicago was its business centre. In those days the facilities for handling grain, of course, could bear no comparison with the wonderful facilities we have today. Chicago, however, had some storage warehouses. It had not become at that time the world's greatest railway centre, and indeed, so far as grain was concerned, it was dependent upon the Illinois river with the Chicago canal connecting to the city, and beyond the Illinois river the great Mississippi into which the Illinois flows. These rivers served the great new agricultural country which was so rapidly increasing its grain production, and most of the grain Chicago obtained came by them and by that little canal.

Now, there had gradually come to exist a number of grain traders at Chicago. The Chicago Board of Trade, as it was called in very early days and has ever since been called, started more as a development association or something between that and a general business body like our local Board of Trade rather than a market place; but it developed into a market centre for grain. At the beginning, those who could trade in it were not only members of this Board but any strangers introduced by them; so it was a meeting place at the beginning for all traders.

CONTINUOUS SUPPLY NECESSARY

One problem is early met with in any centre of trading in grain and is always recurring—that arising out of the fact that

spot grain (that is grain actually in hand at the moment) may not be sufficient to meet the firm orders received. This situation comes about in the natural course of business conducted under the general conditions noted above. Take the case of a baker in eastern North America or Europe. This baker, say, having had a sample of flour made from a certain grade or quality of grain shipped from Chicago, and having adjusted his baking methods and having found that he could produce a thoroughly satisfactory loaf which he was sure his customers would continue to want, would naturally desire to have, for a time at least, a continuous supply of that particular quality. He would not want to take at one time three or six months' supply of flour. In the first place he could probably not finance that at one time and moreover there is danger of damage to flour in keeping. No, he would want some miller to undertake to supply him so much per week or other regular period during three or six months, so that he could produce the same standard and quality of loaf and give it a fair trial with his customers.

Now, if a baker would be prepared to commit himself under certain conditions for three or six months a miller would certainly be prepared to undertake to sell him for the same period because that would mean a large order and an order which would reach out into the future. But the baker would have to know what his cost was going to be and would insist the miller give him a firm price for that length of time. Now, no mills even today keep mill bins big enough to carry stocks sufficient for three to six months' grinding. The miller would have to know what his cost was and have it fixed or he would not be safe in committing himself to the baker. The miller, therefore, would apply, let us say, to a shipper or exporter at Chicago for a firm offer of the total quantity desired at a firm price, so much to be shipped now and so much at later periods.

Now, that shipper in Chicago may have had some spot wheat, but not enough to fill the order. How was he to render himself safe and put himself in a position to fill that miller's order if he took it? What developed, of course, very early was a dealing in "wheat to arrive". The man situated as was the shipper of whom I have spoken would seek someone who would undertake to deliver to him from the interior, before the date at which he would require it, the additional quantity of wheat he needed at a suitable price. Owners of wheat in the interior or those who knew where it could be secured were prepared to make such contracts. De-

ferred cash contracts for wheat "to arrive", were not, of course, peculiar to Chicago, but were common to all wheat markets because the conditions to be met were common conditions of grain trading.

DEFERRED WHEAT CONTRACTS

Professor Boyle, in a very interesting book on the Chicago market, mentions certain incidents. For example, he says that on April 1, 1856—which is quite a long time ago—it happened that there were in store in Chicago altogether, of all kinds of grain, 446,700 bushels. But before the winter had closed in a number of vessels had come into Chicago and there were lying in the harbour at that time lake vessels with a cargo capacity of $1\frac{1}{2}$ million bushels. Everyone who dealt in grain wanted to seize the opportunity of getting early shipment and taking advantage of that tonnage, and activity in the negotiation of contracts with anybody who would undertake to deliver grain as soon as the ice went out of the Chicago canal and the Illinois river was very keen. Contracts were made with farmers, local merchants or local agents, but there was opportunity, and indeed need in a case of that kind, for great enterprise; and men, confident they could obtain the grain in the country at the price and move it, entered into contract with the shipper, and then went off to locate and buy the grain and arrange transportation. They sold it before they bought it and assumed a risk. On the other hand, many who found opportunity made contracts for larger amounts than they were going to require for their own orders on hand. They took a chance and bought before they could sell.

Another incident is mentioned that the Chicago Journal in its issue of April 20, 1854, which is two years earlier than the above, made record of—the case of a Chicago shipper who shortly before had made a contract to accept delivery in July on board a vessel, of 100,000 bushels of corn at 50 cents per bushel, and as this was more corn than he needed, he had just sold a half interest in his contract to some man in New York at a profit of \$3,000. There, gentlemen, was a "long" in forward cash contracts who liquidated part of his holdings at a profit. The man who, thinking he knew the country and conditions, entered into a contract to get wheat and deliver it, before he had actually bought it, was what we would call today a "short".

GRAIN "TO ARRIVE" CONTRACTS

The situation gradually developing in this system of contract making was finally brought to a head at the Civil War in the

United States. There had, indeed, been an extra demand on the system some eight years or so before, at the time of the Crimean War, when special orders had come over from Europe, but when the Civil War opened the government of the northern states was under the necessity, the absolute necessity, of providing for its soldiers in the field, food for the men and feed for the horses. It wanted flour and it wanted oats. It had to have them and those supplies had to be where they were wanted when they were wanted. Moreover, the government could not put itself at the mercy of being held for extravagant prices at some last minute. It was only prudent that the government should insist on binding contracts that these supplies would be on hand where and when they were needed and that prices should be settled beforehand. The government did insist on it. There were no facilities for storage sufficient to have those quantities in spot positions anywhere. Men who took government contracts had to protect themselves by making contracts for grain "to arrive" and people had to go out to find where the grain was and ensure that it came in. So there was a making of contracts to an extent never known before, and transfers and combinings of and cancellations of contracts.

Up to that time the business of making these contracts in grain "to arrive" had gone on just as part of the ordinary cash grain business. Each individual made his own contract with some other individual and took what security he could get as a personal matter. Each contract was for the date set in it and not for a regular period. And the contracts held only between individuals and there was lots of trouble. The amount of detail in making and following up contracts and getting exactly the quantity wanted made business difficult. It became very important and desirable that the business of contract making should be organized on its own basis and the first step toward that was taken in Chicago in May of 1865, just 70 years ago.

FUTURES TRADING STARTED

On that date the Chicago Board established a margin rule, requiring that anyone making a contract should deposit some margin—the first attempt to regularize the giving of security. By the month of October, 1865, the idea had developed and a complete set of rules was drawn up and announced by the Chicago Board of Trade for a market to deal in futures contracts as distinct from the market dealing in cash wheat.

The futures system of trading, as a separate market, therefore, dates from October 13, 1865, and there was established then a

market different in kind from any other market, out of which our futures markets of today have developed.

Contracts in the futures market are binding contracts to make and accept delivery of wheat and either party can secure fulfilment of the exact terms so far as he is concerned. The futures market can, therefore, be used for the same purposes as the old system and with much greater convenience and certainty, but its main use and essential purpose is the dealing in contracts for the security against risk which such contracts afford. Because of its unquestionable superiority over the old system of meeting conditions common to all business, this type of market has since been adopted or copied by every trade which has a large enough volume to have an open market at all.

ENLARGED FIELD OF TRADING

Among the defects of the old system was that security by way of forward contracts could obtain only to the extent to which the consumer or the processor was prepared to give his contract to match a contract by the producer or primary agent. It covered quantities for nearby consumption but left untouched, for the greater part of the year, all that big surplus which has to be carried somewhere and should be protected. The farmer did carry and had to carry most of it, and merchants carried some, but they all had to carry it at their own absolute risk. One of the greatest improvements made in trading by the futures market is, of course, the enlargement of the field of trading until contracts can be secured in this market for a whole crop right after harvest, no matter how big the crop may be.

OPPOSITE RISKS CANCELLED OUT

In merchandising there are two parties to a trade and there are thus two equal and opposite risks. An importer in Europe who, on the basis of today's quotations, finds he can book an order for 10,000 bushels from a miller, is prepared to do so, although he is not yet in possession of the wheat which will be delivered on that order. He is exposed to a grave risk that before he can secure this wheat the price may have changed against him. To meet this risk he immediately gives an order to make a purchase in the futures market—puts out a buying hedge. On the other hand, the line elevator company which pays the farmer today in the country spot cash on the basis of the quotations of today runs a grave risk that the price may change against him before the

wheat can be moved forward to the cash market for sale. He makes a sale in the futures market—puts out a selling hedge. But the risk he runs on 10,000 bushels is the direct opposite to the risk the importer on the other side runs. The risk of the country elevator is that the price should go up before he can buy. Thus on the 10,000 bushels there are equal and opposite risks. By both parties trading in the futures market there is a pooling of those risks and, in effect, the wiping of them out.

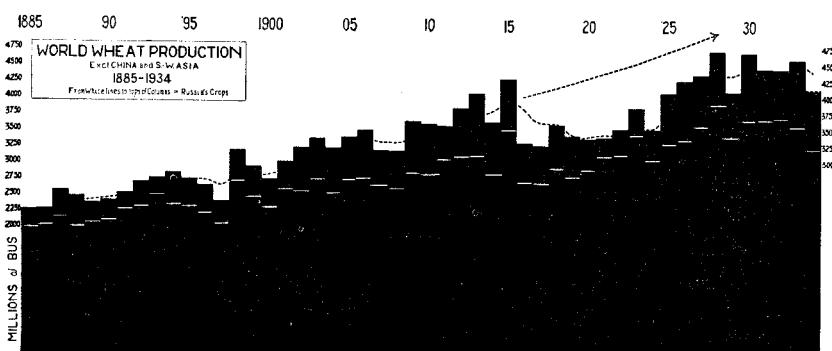
But that still leaves a big bulk of the crop, particularly just after harvest, which must be carried by someone else than merchants in the ordinary course of business. The providing of insurance, as we know, is one of the great businesses of the world. For certain classes of risks we have those vast institutions, our life and fire insurance companies, institutions such as Lloyds and others. These institutions exist to regularize risks and giving the individual only the average cost of all risk instead of making him provide for what may be the exceptional risk in his case. Certain things do not lend themselves to insurance by institutions such as those. It would be impracticable if, before any transactions were carried on in the grain business, one had to get a new policy of insurance and have it all examined and a proper premium determined. The grain business could not be carried on under these conditions, while the futures market system as we have it works out to give the most complete commercial insurance that is provided anywhere. The risks carried, which are outside the matched risks of merchants, are assumed by a class of risk carriers we call speculators.

SPECULATION NOT NEW

Speculation did not become a new thing in wheat when the futures market was established, for the same risks were always present in the business and some were always carrying stocks and going long and going short, but the futures market provided facilities by which those who wished to avoid risk in the handling of grain could do so, leaving the bearing of the risks to those who were prepared to undertake this work.

Now, a great many questions arise to the mind as to what are or may be the effects of speculative buying or selling, or of any other operation in the market. In cases of this kind, the first question to put to ourselves is this: what are the facts? At this point, therefore, I suggest we do the jumping over to which I

referred at the beginning. It is easy to theorize, it is very entertaining at times, and we can be very ingenious about it, but after all, and first of all, what are the facts? We have this great grain trading system with all its various operations. What is the net result of it as shown in facts? When we see the facts and understand them then we are in a position to go back and analyze and properly appraise the various influences at work and their operation. So I would direct your attention to a few of the broad features of the net effects of the system as a whole.



The graph herewith reproduced represents the world's wheat production yearly for 50 years—from 1885 to 1934. There is included in the figures the production of all countries except China and southwest Asia, for which districts there have never been definite returns. The quantities produced in Russia each year are shown from the white lines to the tops of the columns. I do not propose to enter into details in connection with the facts represented in this chart, but I would like to call your attention to the definite trend of expansion of the world wheat production up to the year 1915, the beginning of the war. There are irregularities in the line of development, due to climatic conditions and variations in the rate of increase in acreage, but there is a very astonishing consistency of trend upward. This is one of the most consistent trends I have ever observed in the study of any economic factor. On the average the production of wheat in the world during that period increased $1\frac{3}{4}$ per cent. cumulatively per year. Whether that was exactly the rate of increase of the world's population I would not care to say too positively, because authorities are not agreed as to just how fast population has been growing, but if the result was not due simply to the increase of the world's

population, and most of it was, then there was also a very steady expansion in the use of wheat.

Those of us who are old enough to remember 1915 and before, will know that we were not then being worried about world excess. There were some variations in what we call carry-overs but the world's markets prior to 1915 were never seriously bothered with world excesses. What did that mean? It meant the world's consumption of wheat very closely indeed followed the line of production and both regularly expanded during the period.

After 1915 the effects of war conditions are seen. After 1921 very rapid recovery in production began, continuing up to 1928, but even the record crop of that year fell short, as will be noted, of the point indicated by a projection of the line of trend before the war. Since 1928 there has been restriction of production with a somewhat declining trend.

OPEN MARKET CONDITIONS FAVORABLE

Without attempting to establish an argument, it may be pointed out in passing that between 1885 and 1914 the world's grain trading system was in reasonably free operation and we had an open market. Restrictions on trading as well as interferences with production existed during the war years. The markets were opened again about 1921, whereas since 1928 artificial marketing conditions have again been imposed. Without trying to determine relations of cause and effect, it may at least be noted as a fact that open market conditions have coincided in time with expanding wheat production and consumption and an absence of troublesome excesses, and that therefore such open market conditions have not been unfavorable to development in the wheat industry. Whether or not it has ever been really profitable to grow wheat may be left to others to dispute, but, on the facts, the world has found it worth while to expand production under normal marketing conditions.

QUANTITY AND PRICE RELATIONSHIP

With this general picture of the development of production and consumption in mind, it may now be enquired what has been the relationship between quantity and price. Has this relationship been haphazard or according to some general principle? That price making is haphazard may appear to some merely from the multiplicity of agencies engaged or the shoutings on the trading

floors. But what are the facts? How does the system in reality work out?

I have analyzed the statistics of world crops in relation to Liverpool prices, first for the ten years before the war, 1904-5 to 1913-14, and second for the ten years 1920-21 to 1929-30, from the re-opening of the Liverpool market after the war to the beginning of the world deflation of all prices.

That the average price level of a crop year has, as a matter of fact, varied up and down as the world crop has been smaller or larger is clearly apparent, and is unquestionable. Over a good portion of the periods covered the percentage of price change approaches closely the percentage of change in quantities.

In the 10 years before the war there are two apparent departures from the generally close conformity. One is in respect to the year 1908-09 where the price level was a little higher in spite of the fact that the crop that year was a little larger than in the preceding year, but figures of world production have been revised since my study was made and the crop of 1908-09 is now reported slightly smaller instead of larger than that of 1907-08, and in any case there were at that time two successive very small world crops and a gradually rising price line throughout the whole two year period would seem to have been a natural tendency.

The other exception is in respect to the year 1910-11 in which prices declined, although production was not as large as in 1909-10. In those two years Russia had the largest crops she had ever grown up to that time and the Balkans had unusually large crops. At the beginning of 1919-21 Russia and the Balkans entered upon the heaviest export shipments ever made from the Black Sea, and during the first quarter of that year shipped 70 per cent. of total world shipments. It was under these conditions that lower prices prevailed.

When all contingencies are considered and recognizing all variations, the correspondence of price to quality is truly remarkable. If such results are, as a fact, produced by the marketing system in periods in which it has had reasonably free operation, then any theories about that system or the influences that operate in it must be checked by this fact and cannot be correct if they are at variance with it.

WHEAT TREATED FAIRLY

Wheat prices, of course, must be judged by their relation to other prices. Without dwelling upon it, I would like to call your attention to the statistics of Winnipeg wheat prices and their relationship to the course of general wholesale prices in Canada for the 20 years, from 1913-14 to 1932-33. Wheat prices have tended to vary in accordance with the course of general prices, some times being higher and some times lower as conditions particularly affecting wheat exerted their influence, but on the basis of the relationship existing in 1913-14, wheat prices have been above parity more often than below. In a similar way I have compared Liverpool wheat prices with general wholesale prices in Great Britain back to 1885 with the same general result. Again as a matter of fact, the wheat markets over an extended period have not treated wheat unfairly as compared with all commodities on the average, and theories must conform to this fact.

Futures trading is an important part of the marketing system under which the above results are attained. Speculative operations are involved in necessary risk carrying, but if speculation had the powers many ascribe to it and was always distorting price to its own ends such distortions would appear in the history of prices in their relationship to quantities and to other prices. The dangers of speculation are not nearly as serious as many think. It is not easy to influence price. The volume of the world wheat trade is so large that it tends to give the market steadiness. There must really be a majority opinion in the market that price is going to move up or down before any particular operator is likely to create much effect, either on the bull or on the bear side. The spectacular bull operations or "corners" in the past have occurred only when world crops declined during at least two successive years, and looking over the records of prices we have discussed tonight, where have bear raids succeeded in distorting the levels?

THE PROPER APPROACH

I have tonight merely opened up the subject. I have touched upon the general conditions affecting all business, upon the beginnings of the modern wheat marketing system, and then upon the general effects of this system in the history of prices and of production. It is in the light of all these considerations one must approach the detailed study of speculation or of any other operation or functions in grain marketing.

THE EVOLUTION OF THE ENGLISH GRAIN MARKET

When I found that the address I promised to give before this Club was entitled "The History of the Marketing of Foodstuffs", I was appalled at its scope and I realized the subject would have to be drastically cut down. In the first place, the history of the marketing of foodstuffs extends backward in history to the beginning of civilization and it is obvious that there would be no time to trace the evolution of marketing down to our own period. In the second place, there is more than one variety of foodstuffs, each with its own story and each with its own technique of marketing. For example, during the Middle Ages there was relatively a very large consumption of fish. The methods by which fish supplies were procured, sold and distributed in northern Europe are a very interesting story in the history of sea power and commercial rivalry. Similarly the rise of the meat packing industry and the transportation and marketing of fruit might be mentioned, to say nothing of coffee, tea, nuts, spices and wines. In the time at my disposal I intend to confine myself purely to the marketing of grain. Even when confining myself to grain it is necessary to set further limits to the subject, for if you examine the grain trade of the Baltic or of France you will discover that it did not run along quite the same lines of development as in England. What I propose to do is to give a brief survey of the evolution of the English corn market, since it was with that market that both the United States and Canada were most closely in touch during the years that their own trading institutions were taking form. You must keep in mind, of course, that in England all grains are called corn, except corn, which is called maize.

RISE OF ENGLISH CORN MARKET

The three basic conditions necessary for a corn market to develop are: (1), the growth of areas such as towns or cities where there is a deficiency of corn; (2), the production of sufficient corn in the countryside to enable the surplus to be shipped for sale, and (3), the ability to convey the supplies either by land or water from the producing area to the deficit area.

These conditions existed in England about the beginning of the thirteenth century, but of course the scale upon which operations were conducted was extremely small compared with modern standards. The roads were unbelievably bad and continued to be so for 500 years. As one writer said, they were as God left them

after the flood. Hence it frequently happened that there might be a surplus in one part of the country and stark famine in another part. As late as 1817 in France people were dying of famine in Lorraine, while wheat was abundant in Brittany. Twenty miles by land, a ten hour journey, was frequently the profitable limit of grain carriage, and for a long time 300 miles was the extreme limit of land carriage. For this reason there developed traffic by rivers and particularly along the coast. Hence the coasting trade and short sea trips such as between England and France and the Netherlands were features of the early grain trade.

SMALL SIZE OF EARLY CORN TRADE

We are so accustomed to thinking in present day terms that we forget the small population of England. Between 1300 and 1500 England had a population of between two and three million people. At the close of the reign of Queen Elizabeth this had increased to four million and at the beginning of the nineteenth century the population of England was around ten million people. This is a long way from the forty million people who now live in England and Wales. When we turn to the cities it is estimated that at the beginning of the sixteenth century London did not have a population greater than fifty thousand people. One hundred years later this had increased to approximately 225 thousand. London did not reach one million people until after 1800. In 1685 Bristol, with less than thirty thousand people, was the second city in the Kingdom. Until well into the eighteenth century the other cities were quite small, possibly five thousand people apiece. Liverpool at the beginning of the eighteenth century was a small town of four or five thousand inhabitants, but grew very rapidly thereafter on coffee, cotton and slaves.

The significance of these figures is that without large aggregations of people, trade in corn was very small. As late as 1700 it was estimated that the consumption of corn in London, including barley for beer and oats for horse feed, did not exceed 1,500,000 quarters, or 12 million bushels. The rapid growth of London during the eighteenth century was of immense importance to the corn trade. London then became the centre to which all traders looked and it was really the growth of London that broke up the earlier organization of the corn trade which centred in local town and city corn markets.

ENGLAND'S EXTERNAL CORN TRADE

When we turn to the external trade we find that depending upon the relative conditions of dearth and of plenty, England was

at one time an importer of wheat and at another time engaged in its export. It is roughly accurate to say that until the reign of Queen Elizabeth, England was chiefly an importer of corn due to local crop failures. About the beginning of the seventeenth century there was marked improvement in the arts of agriculture and at the same time an attempt began to be made to make England self-sufficient in the matter of corn supplies. The Government came to the assistance of the wheat growers with bounties upon exports, the chief idea being that England should always produce enough for her own consumption in bad years and have corn to export in good years. As a result of this development, for roughly a century and a half, England was on balance an exporter of wheat rather than an importer. In 1749-50 England exported 1,667,778 quarters.

The rapid increase of population after 1750 made it impossible to maintain such a position. The corn laws were continued, however, but their chief purpose was to protect the English corn growers from the pressure of outside supplies. The corn laws finally fell before the necessities of increasing population. 1836 was the last year in which England grew enough wheat to feed herself. England in the nineteenth century became definitely an importing country. The recent revival of bounties to English wheat growers does not hold out any hope that England will ever again recover self-sufficiency in wheat. The bounty is rather to be regarded as a bonus to a distressed class of producers.

EARLY DEVELOPMENT OF LOCAL CORN MARKETS

With this as a general background, let us turn to the development of the local corn markets with which commerce in corn seems to have begun and which endured without much change in England for a period of around four hundred years. The privilege of holding a market was a definite grant from the Crown. Closely connected with the right to hold a market was the right to keep a beam or steelyard with its weights, a yard measure and a bushel measure. On the day that a new mayor took office, his predecessor handed over to him the official measures. Forthwith he was required to send out his councillors to carry all measures to the mayor's house to be compared with the standards. One of the duties of the mayor was to wage continuous war on the use of false measures.

One of the difficulties of trading in corn was the horrible complexity of weights and measures. Grain dealers in Newcastle sold by the boll of two or six bushels; Carlisle by the bag of three

bushels; Norfolk by the coomb of four; Hertford and Bedford by the load of five; Furness by the load of three and one-half; the West Riding by the load of three, and London by the quarter of eight bushels. The official bushel measure itself was a measure of capacity and became a measure of weight also. Both these measures varied in different parts of the country. In Shropshire a bushel was 75 pounds; in Yorkshire, 60 pounds; Lancashire 70 pounds, and so forth. It was not until 1834 that official weights were standardized by an act of Parliament. As to the origin of the London quarter of eight bushels, this is not known. There is a story that Lord Kelvin, giving evidence before a Royal Commission on weights and measures, asked the head of the standard office of what a quarter was the quarter. He failed to obtain any light on the subject and he himself said he did not know. As one writer points out, the size of the corn measure is the standing difficulty in the way of interpreting any figures either of prices or quantities for Europe or England before modern times.

Between 1200 and 1482 about five thousand local centres of England obtained a grant from the Crown which enabled them to hold markets or fairs. This great increase went roughly with the swing-over to a money economy. The privilege of holding a market was valuable for three reasons: (1), Supplies were obtained more cheaply; (2) the market tolls and rental for stalls were a valuable source of revenue to the town; and (3), the market provided publicity to exchange transactions. This latter appears to have been a very valuable consideration in the Middle Ages. One gathers the impression that if an individual was found in the possession of goods which he could not clearly account for, the presumption was that he had obtained them by dishonest means. Goods sold in the open market gave the purchaser a clear title. In this connection, it is interesting to note that the **broker** was a town official, whose function was to introduce the seller to the buyer and to witness the transaction. For witnessing the transaction he received a fee. There are, of course, many references of attempts by brokers to go beyond this function. Incidentally, one should notice the **Court of Pie Poudre**. This was the Court of Record held in connection with every fair and market of which the steward, who controlled the market tolls, was the judge. Its jurisdiction extended to administer justice to all commercial injuries done in that very fair or market but not in any preceding one. The injury must be done, complained of, heard and determined within the compass of one and the same day, unless the

fair or the market continued longer. The purpose, of course, is one that would appeal to modern traders as an endeavor to settle marketing disputes quickly and in a summary way.

THEORY OF THE MEDIAEVAL CORN MARKET

The theory upon which the market operated was that the purchaser and the consumer should be brought together without the intervention of a middleman. The intent of the market was to make goods cheaper to the consumer and the interests of the consumer ran from first to last through all market regulations. An analysis of grain marketing regulations shows the following to be the main rules:

1. Corn was to be sold on the market only.
2. Forestalling was prohibited.
3. No one was to put his corn for sale at a higher price than he first asked for it.
4. The time for selling corn on the market was fixed.
5. The admission to the market of different classes of buyers was regulated.
6. The quantity of corn was regulated.
7. The prices were fixed.
8. The relations between producers, porters, market and shop dealers were regulated.
9. The validity of agency in the corn trade was regulated.
10. The activities of the broker were limited.
11. The right of storing up corn was dealt with.

FORESTALLING, ENROSSING AND REGRATING

The three great offences against marketing law were forestalling, engrossing and regrating. To forestall was to go out beyond the borough or market town to buy up goods coming to market. The objection to forestalling was, that it undermined the public and open market and tended to raise prices there and also that it resulted in a loss of local revenue. This would occur because if the forestaller was a burgess of the town and the seller of the goods a stranger, while the latter was subject to town tolls the former was not. It is rather interesting to note that in the marketing of cattle and hogs at the present time one of the current complaints is really that the packers forestall the markets by buying their supplies direct and trucking them into their plants and that they thus undermine the public market. In this

case, though, the complaint is that the effects of this transaction is to lower prices on the public market by reducing the number of purchasers.

Engrossing was buying with the intention of selling again, while regrating was defined as persons buying grain or other victuals and reselling the same in the same market place or in any other fair or market within four miles. The regrater corresponds to the modern retailer. The penalties against any of these practices were heavy. At various times grain dealers stood in the pillory for offences against these regulations. As late as 1800 there was a prosecution in England against a person who in the corn market bought wheat at 41 shillings and resold it to another dealer at 43 shillings. The dealer, I believe, was found guilty. Although there were no subsequent prosecutions, it was not until 1844 that the offences of forestalling, regrating and engrossing were abolished. Behind all these regulations was the attempt of the townspeople to prevent the local markets being monopolized by one man or by a ring of traders. An interesting thing to observe is, that while throughout the Middle Ages the activities of the middlemen were viewed with inveterate suspicion and dislike and while this attitude continued to be widespread in the sixteenth, seventeenth and eighteenth centuries, yet the grain dealer survived all these regulations and continued his trading activities. While apparently bound hand and foot, he was able to continue and there are records that in many cases corn dealers became men of wealth. One writer declares that the legislation relating to middlemen shows that two things are outstanding in their history—their extreme unpopularity and their apparent indispensability. Acts of Parliament and Government edicts fulminated against them but failed signally to dislodge them from the economic system. One suggestion is that the local magistrates were generally landowners and with an eye to their own advantage as landowners, dealt lightly with offences committed by the corn-mongers. Another writer says that the Government regulations were treated with cheerful indifference. The indispensability of the cornmongers was explained by the nature of the function they served; their unpopularity by the opportunities which they enjoyed for abusing this function.

INFLUENCE OF GROWTH OF LONDON

The growth of towns, especially London, gradually began to bring about a change of attitude. It was recognized that where large towns existed corn had to be carried from a distance and on

the other hand that the attempt to confine the producer to his own local market might not be in his best interest. To ensure adequate supplies for a city such as London, restrictions must be relaxed. Moreover, it began to be seen that dealers by buying when there was abundance and holding corn until there was a relative scarcity, equalized supplies between the two periods.

The rise of London as a large city to which supplies could be carried for sale succeeded the era of local markets. The London quarter tended to become the standard corn measure and local prices tended to be determined by the relation of local prices to London and the cost of carrying corn to London. The business of supplying London with corn was in the hands of various classes of dealers who were known as badgers, cornmongers, corn factors, hoymen, kidders, corn merchants, regraters and by other names. Many of these names meant the same class of trader. I have already mentioned the rise of the brokers. The badgers or baggers and cornmongers were dealers who bought corn locally and supplied the larger markets. Corn factors were the agents of larger men with a special knowledge of particular local conditions in one part of the country or another. The Kentish hoymen were shipmasters who carried farmers' corn to market and sold it on commission. The corn merchant was the equivalent to a wholesaler who might also be an importer or exporter. As I have already pointed out, regraters were the retail traders. Along with these groups were the miller, the mealman and the maltster. A good bit of the corn consumed in London was actually ground outside the city. By reason of a lack of good running water in London a great deal of the malting business of the period, which was heavy, was done at points outside the city.

In London itself the four corn markets of mediaeval times were known as Grace Church and Newgate for corn arriving by land from different counties and Queen Hythe and Billingsgate for corn arriving by water. Queen Hythe was notable as a corn wharf, grain being delivered at this point both from abroad and up the River Thames. Later on these names disappear and that of Bear Quay and Mark Lane become prominent. Bear Quay was the wharf where the coasting vessels unloaded their grain. Around 1760 a group of corn factors and Kentish hoymen, leading dealers at Bear Quay, bought a plot of land in Mark Lane and built an exchange. It was a private venture divided into eighty proprietor shares and managed by a committee of proprietors. It provided a number of stands, though dealing on the exchange was possible

without having a stand. Soon there were complaints of rings and market rigging, but no suggestion of interference with this property was ever discussed in Parliament or out of it, so far as is known. The fact that it handled only part of the London corn trade and more fodder grains than wheat sheltered it from criticism. The Baltic Exchange had its origin in a coffee house in 1744, frequented by merchants engaged in Russian trade, which consisted chiefly of tallow, oil, flax and seed. In 1899 the London Shipping Exchange united with it to form a joint exchange.

LIVERPOOL

I am not able to deal with the early beginnings of the Liverpool Corn Exchange. In 1803, when a fire occurred there, the grain lost in warehouses was valued at \$192,000. In the year 1805 Liverpool was made a warehousing port, that is to say, was given authority to store goods in bond and to export without payment of duty if the goods were intended for overseas consumption. Liverpool is credited by a very careful writer with having, during the decade of 1820-1830, a larger and better exchange than Mark Lane. The first association at Liverpool was formed in 1853. The association was incorporated as a company in 1886, and the present Liverpool Corn Trade Association Limited registered in 1897. The average handlings of wheat between 1841 and 1851 were about 4 million bushels. This grew rapidly until wheat handlings amounted to around 40 million bushels. Wheat receipts for Liverpool and Manchester, 1934-35, were placed at nearly 7 million quarters, London slightly less.

CORN TRADE 1800-1900

It was really during the nineteenth century that the corn trade took on large proportions. In 1800 a French economist estimated international trade in grains at 30 million bushels at the most. In 1887 it was placed at 1,500,000,000 bushels. In the first half of the nineteenth century the import of trade of England was erratic and intermittent, due to the crop conditions and the operation of the Corn Laws. Corn came from the Baltic, Germany and small supplies from America. The English traders guided themselves by the Danzig prices. While there was always some wheat imported since it could be warehoused and re-exported, yet there were years where on balance England lived within her own supplies. Thus, in 1820-1825, good harvests and the Corn Laws made imports into England insignificant. A series of bad crops between 1829-1831 resulted in the importation of about 400 thousand tons

annually. After that the trade fell away for a period but a recurrence of bad harvests led to the repeal of the Corn Laws in 1845. From that period Britain has imported wheat freely. If you consider the import trade into Britain that has developed since 1850, the chief features are that in the decade between 1860-1870, there was a very rapid development of the corn trade between Russia and England. The wheat fields of the rich black earth of southern Russia were brought within reach of her market and trade expanded via the Black Sea. The next development is the rise to an important position of the grain trade and importations from the United States. They really did not become of any magnitude until after 1850. Between 1850 and 1860 Chicago shipments eastward increased roughly from 2 to 20 million. Between 1880 and 1900 exports from America rose rapidly until around the turn of the century they averaged 200 million bushels per year. As you are well aware, the great expansion of our own trade and of the Argentine began with the war period.

Between 1870 and the present, the methods of marketing corn were powerfully influenced by three factors. These were, first, bulk handling and steam which greatly cheapened transportation and enabled corn to be delivered at a very low cost in Great Britain and Europe. Second, the development of official grading systems which facilitated marketing by making it possible to deal in corn without relying on a direct examination of each parcel, and thirdly, and most important of all, the extension of the means of rapid communication. It was the telegraph and the cable that made possible a world grain market, defining the market in the modern acceptance of the term as any region in which buyers and sellers are in such free intercourse with one another that the prices of the same goods, allowance being made for the expense of delivery, tend to equality easily and quickly.

I need not follow out the evolution of grain marketing methods since 1914. The war led to the introduction of systems of controlled marketing. An attempt was made after the conclusion of peace to revert to pre-war methods, but was never wholly successful. Recent years have witnessed the rise of various types of marketing agencies and of controls which differ from the open market system. Quotas limit the right of free shipment. Wheat marketing boards are set over against wheat import boards. Highly integrated and unified market groups deal with equally highly integrated and organized milling and baking

groups. Such conditions take away some of the realities of free competition. Technically the economist would call this a condition of imperfect competition, that is, a condition where a trade is in the hands of a few powerful concerns and the action of any one concern has a noticeable influence upon the market. It is a real question when the world wheat market will again achieve the degree of freedom and flexibility that it enjoyed before 1914. However, I would remind you that despite determined efforts for 600 years in England to eliminate by regulation the middleman, he continued to persist and retain a place for himself in the economic system, and as long as the middleman, by superior efficiency, can make himself indispensable, he will continue.

QUESTIONS AND ANSWERS

Question—You told us about building warehouses in England. Could you tell us when and where the first elevator, as we know it, was built?

Answer—As far as I could discover, the first elevator, as we know them, began in Chicago. Now, I am not absolutely certain about that, but some years ago I went on the trail of that information and I made a rather extensive survey in Washington and it was traced back there. The first warehousing was in cities and then it moved from the cities back into the country, and from Chicago it also moved in the other direction to Buffalo, and as far as I recollect it was either at Chicago or Buffalo; I think it was at Buffalo and moving back from Chicago into Illinois about 1839. I would have to check it.

Note: The grain elevator made its first appearance in Buffalo in 1841. Shortly after it appeared in Chicago.

Question—Could you tell us when producers first raised any agitation to be protected against what they considered were marketing abuses? You told us about the agitation in England to protect the consumer; could you tell us when the first agitation started to protect the producer?

Answer—I think I suggested that while strict regulations were imposed on the merchants, yet the peculiar characteristic that the merchants continued to exist and flourish, has been attributed to the feeling of the countrymen that grain merchants were of value to them.

Question—What you have just said was, that the merchant continued to flourish in spite of the complaint of the consumer. What I wanted to know was, can you tell us when the complaints of the producer first became vocal?

Answer—The producer apparently sympathized with the merchant and would not put him in jail or lay a complaint against him during the middle ages. But I cannot go beyond that at the moment.

Question—When was grain first grown in Canada?

Answer—I have forgotten the exact date. It was grown at Annapolis in Nova Scotia. Next was, of course, in Quebec, 1624 or 1625. Champlain, if I remember correctly, was then in Quebec. He had two or three sheaves of wheat rubbed out and sent to the French King in order that he might popularize the magnitude of his discovery in Canada by saying that it was a country which produced good wheat.

Note: Wheat is reputed to have been first grown on this continent at Annapolis in 1605.

Question—Does not your book say Jacques Cartier found some grains of wheat in Indian graves at Hochelaga?

Answer—It isn't mine.

Question—Have you mentioned tonight, or can you tell us now when the first grain exchange was organized as a self-governing body with a limited membership?

Answer—I would not go beyond England in that. I think I gave it tonight regarding the rise of Mark Lane in 1749 or 1750. That, I think, is the first record I could get of a grain exchange in England dealing chiefly in grain. I would not say anything about Danzig. In the first place I know of no books in the city I could check through, but Danzig began very early. I could go back to Rome. The subject is such an immense one that unless you are in a city which has a reasonably respectable library you cannot locate those things.

Question—What I had reference to was a grain exchange organized as a self-governing body, limiting its membership and placing a value on it. We understand these old grain exchanges were open to anybody who wanted to come in.

Answer—I do not think Mark Lane was open generally. It was privately purchased by merchants, so many proprietors who had so many stalls and these were owned by the proprietors of Mark Lane. That was in the middle of the 18th century and that, I think, as far as England was concerned, was the first exchange in which you could recognize the modern exchange system as far as grain was concerned. As far as England was concerned

I think Mark Lane in the middle of the 18th century was an exchange in its general details the same as the modern exchange.

Question—Do you know of the existence of any commodity futures market before the Chicago market in 1875? Any commodity futures market established anywhere before that time?

Answer—I spent all last evening trying to trace that question down myself and cannot find any references.

Speculation takes so many forms. At least I went through a dozen books but could not find any particular date just when or where they all describe it but do not trace its history backyards. The "Dictionary of Political Economy", does that. The "Encyclopedia of Social Sciences" does the same, also a series of other books that I went through. A very early type of futures market was found in Holland (1722) dealing in all kinds of articles for which it was possible to fix some standard average quality as a basis for the transactions.

Note: "Stages in the development of produce, mineral and metal exchanges are not easily traced, because records are scarce. Now and then a definite date can be given, a date for instance at which some standard type of goods was formally adopted by the traders of a particular market, as a basis for "future" transactions. Thus the futures market for coffee was organized at Havre in 1882. Similar organization followed in Hamburg, Antwerp, London, Marseilles, Amsterdam and Rotterdam. But in such cases it is probable that informal transactions in futures long preceded the official organization. The Dutch markets for colonial produce, as we know, were highly organized in the eighteenth century; and so soon as Holland had recovered her commercial independence, after 1815, she began to rebuild her commercial machinery. The market for American cotton developed in its modern form at Liverpool between 1841 and 1876. Liverpool was followed by Havre, and Havre by Hamburg and by Bremen, where a cotton exchange was organized to include both Bremen dealers and up-country spinners in 1886. Other outstanding cotton markets towards the end of the century were Antwerp, Dunkirk, Marseilles, Genoa and Venice. Commodities like coffee and cotton, for which all Europe was entirely dependent on imports, naturally acquired specialized markets early. Grain and flour followed, as the continental nations became partially dependent on imports, and adopted the trading methods of Chicago, London and Liverpool, during the eighties". Clapham. Economic Development of France and Germany, 1815-1915. p. 372.

Question—I have seen it stated on one occasion that the futures market in Hamburg was closed by the act of either the local or the German Government and that within a very few weeks the market was re-opened at the earnest request of the Government that had closed it. Do you know anything of that?

Answer—I have seen references to a market (I do not recall whether it was a futures market) being closed in Germany and being re-opened under the conditions you state. Of course, you know in modern times they practically did that in Berlin. It is contained in “Clapham’s Economic Development of France and Germany 1815-1914”. That is, a speculative market there about 1896.

Note: “Until 1896, supervision had nowhere gone the length of prescribing certain classes of business. This was what the German law did. It forbade the prevalent type of ‘future’ dealings in grain, flour, and flour mill products, and in certain classes of securities. It attempted to limit, as was believed in the public interest, the establishment or maintenance of other such markets, and the admission to them of unqualified persons. No new ‘futures’ market was to be officially sanctioned, until the relevant groups of traders and manufacturers had been fully consulted; and no one was to be admitted to such a market who had not established, by his position in the commercial world, his ‘fitness’ for the business. Futures contracts in which both parties were not ‘fit to deal in futures’ (borsentermingeschaftsfahig) were not to be legally binding. The law killed, as it was intended to kill, the existing organization of future dealings in grain at Berlin, Mannheim and other centres. Buying and selling for future delivery did not cease; but a heavy blow was struck at the Berlin grain trade. There was a struggle between the brokers and government over the general question of control; and in the long run not all the contemplated measures of control were applied. Apparently amateur speculation was checked; but whether this particular measure of protection for fools was worth the general interference with the self-determination of the commercial world has often called in question. More than ten years later Germans were pointing with some envy and with generous appreciation, to the self-determining exchanges of England and their successful careers”. Clapham, Economic Development of France and Germany, 1815-1914. p. 374.

WHEAT MARKETING PROBLEMS IN CANADA

The paper which I am presenting to you this evening is on the subject assigned to me. There are other subjects I would have preferred dealing with, although I welcome this opportunity to present to you some facts, figures and views from a practical grain man's standpoint respecting our Grain Trade history. I hope that I may be able to throw some new light and encourage some new thoughts in our studies of Grain Trade problems.

Canada is a very young country in the grain world. The Grain Trade in this country and especially the export trade in grain was of small dimensions until the turn of the last century. After 1900 there was a fairly rapid development, based almost altogether on the growth and development of the three western provinces, Manitoba, Saskatchewan and Alberta. There were some small shipments of wheat prior to 1890. From 1890, the business grew slowly to a total of 9,739,000 bushels for the season 1900-1901. Since then the importance of Canada in the export markets of the world has steadily mounted, reaching a peak in the season of 1928-1929, when a total of 407,564,000 bushels of wheat and a total of 60,661,000 of other grains were exported.

FIVE DISTINCT PERIODS

In my opinion, the history of the Grain Trade of Canada can be divided into at least five distinct periods or epochs:—

The first period, from the earliest days to 1904, which might be called the pioneer stage.

The second, from 1904 to 1917, to which we might add the period following the Wheat Board to 1923. This was the period following establishment of a futures market in Canada, a period of rapid growth and development to well nigh perfection, based on methods tried and proven.

The third represents the period during the war, when the Government of Canada saw fit to control the marketing of wheat, through the Board of Supervisors, 1917-1919 and the Wheat Board 1919-1920.

The fourth, from the start of the great pool experiment in 1923 to its failure in 1930.

The fifth, from 1930 to 1935, during which the Federal Government carried on the so-called stabilization operations.

We might well say we are now in the sixth period, starting with September of this year, commencement of the new Federal policy, which we hope will result in the early return of the Grain Trade to normal functioning in all respects and of better prices and prosperity for our farmers and for Canada as a whole.

SOME OUTSTANDING DEVELOPMENTS

Before dealing with the particular aspects of each of these periods, I feel I should list some outstanding developments of our Grain Trade history.

The first Grain Exchange, known as the Winnipeg Grain and Produce Exchange, was opened in 1887, but was not incorporated until 1891.

When in 1908 a bill was passed by the Provincial Legislature of Manitoba to amend the charter, it was decided to dissolve the Exchange as then constituted and a new voluntary organization was formed under the name of the Winnipeg Grain Exchange, under which name it has functioned to this date.

Its by-laws, rules and regulations require a high standard of business morality and provide safeguards for both producer and merchant.

In 1897 there was an investigation into the Grain Trade by a special committee of the House of Commons. In 1899 the Federal Government created a Royal Commission to investigate the marketing of grain. As a result the Manitoba Grain Act was passed in 1900, an act which subjected the grain business to Federal control and supervision, such as is not applied to any other business in Canada. A Warehouse Commissioner was appointed to administer the act. In 1906, the Federal Government created a second Royal Commission on the marketing of grain. As a result of the second commission, the Manitoba Grain Act was amended and the control over the grain business was made more detailed and more comprehensive.

In 1907 the Manitoba Government prosecuted the Grain Trade in the courts for conspiracy. The Judge, Mr. Justice Phippen, vindicated the Grain Trade and his verdict was confirmed by the Court of Appeal.

In 1909 the Manitoba Government entered the grain business. It bought and operated a large number of country elevators. The venture was not prosperous and operations were discontinued a few years later, the elevators being first leased and then sold. This was the first instance of public ownership and operation in the Grain Trade of Canada.

In 1910 the Saskatchewan Government created a Royal Commission to investigate country elevators. This resulted in the formation of the Saskatchewan Co-Operative Elevator Company, financed by the government but owned and controlled by the producers. A similar policy was followed in Alberta later.

In 1912 the Dominion Government amended existing grain legislation, embodied it in the Canada Grain Act and created a permanent Board of Grain Commissioners to administer it. The Board amongst its other duties, fixes country and terminal elevator rates, controls the inspection and weighing of grain, investigates complaints and has the power to inflict penalties either by fine or imprisonment. It has built and it operates a line of Government-owned terminal elevators, competing at low rates with privately-owned terminal facilities.

In 1914 the Saskatchewan Government created a second Royal Commission on grain to investigate the handling and marketing of grain generally and more particularly those phases of it that lie outside the Province of Saskatchewan. Although a report was submitted, no action resulted.

In 1917 the Dominion Government ordered a special investigation into the Lake Terminal Elevators by Price Waterhouse & Company.

In 1917 the Dominion Government created the Board of Grain Supervisors, which controlled the marketing of wheat for over two years.

In 1919 the Dominion Government created the Canadian Wheat Board which controlled the marketing of wheat for one year.

In 1921 the Saskatchewan Government commissioned Mr. Jas. Stewart and Mr. F. W. Riddell, to report on the marketing of grain.

In 1923 the Dominion Government created a Royal Grain Enquiry Commission to investigate the handling and marketing of grain in its various phases.

In 1931, the Government of Manitoba appointed a Royal Commission to enquire into charges against the Manitoba Pool Elevators Limited. The findings indicated that the charges were substantially proven.

In the same year the Dominion Government appointed the Commission to enquire into Trading in Grain Futures.

In all there have been at least sixteen investigations held by Commissioners appointed by Federal or Provincial authorities and it is a noteworthy fact that not one of these Commissions reported adversely on the Winnipeg Grain Exchange.

FIRST CO-OPERATIVE ORGANIZATION

The first co-operative organizations in Western Canada were in the form of local companies to provide elevator facilities for their shareholders. In 1899, out of 447 country elevators, 26 were owned by farmers.

The Grain Growers Grain Company Limited was organized under Manitoba Charter in 1906. After many vicissitudes, the company gradually gained strength and developed into a large organization. A more or less gradual evolution brought it to recognized methods of operating as country elevator operators, terminal elevator operators, commission merchants and exporters. It operates at this time under the name of United Grain Growers Limited and has maintained its farmer ownership.

In 1910 the Saskatchewan Co-Operative Elevator Company Limited was organized as I have previously stated, with the financial backing of the Provincial Government. The company expanded rapidly by building country elevators throughout Saskatchewan and terminal elevators at Port Arthur. It engaged in the grain commission business and in the latter years of its existence, went into the grain shipping and export business, in connection with which the company built a large transfer elevator at Buffalo, New York. The company was well managed and operated successfully until its absorption into the Saskatchewan Pool Elevators Limited. Throughout it was owned and controlled wholly by farmers.

In 1913, the Alberta Farmers Co-operative Elevator Company was formed along similar lines to that in Saskatchewan. In 1917, as a result of negotiations looking to the amalgamation of all farmer-owned companies, it was merged with the Grain Growers Grain Company Limited, to form the United Grain Growers Limited.

In 1923 there was formed the Alberta Pool Elevators Limited and in 1924 the Manitoba Pool Elevators Limited and the Saskatchewan Pool Elevators Limited. A Central Selling Agency under the name of Canadian Co-operative Wheat Producers Limited was organized in the same year. This climaxed the so-called co-operative movement in Western Canada. This development was

of such a revolutionary nature, of such importance in its effects on the grain marketing history of Canada, that I shall deal with it separately later. All these co-operative companies have been members of the Winnipeg Grain Exchange almost from their inception, have made use of its facilities and have competed to the fullest extent in all branches of the Grain Trade.

With this introduction, I will now take you to a study of the various periods to which I have previously referred, with particular reference to their nature, methods, service performed, effects, and what is most important, the results achieved from a price standpoint.

THE PIONEER STAGE

The first of these I have referred to as the Pioneer stage. It was not until 1876 and 1877 that the first small shipments of wheat were made from Manitoba, these moving by steamer up the Red River, then by rail through the U.S.A. It was not until 1884 that the first shipment went out for export from Western Canada, moving over the newly-constructed C.P.R. line to Fort William and thence by boat and rail to seaboard. In 1903, the last year of this period, the total production of wheat in Western Canada amounted to 56 million bushels. The first small lots of grain were handled in bags, probably through a small warehouse. When the first rail lines were built in Manitoba, bulk handling commenced. Small warehouses were built at some points, grain being handled through them by manual labor and in some cases by horsepower. About the same time the first elevators were constructed along the lines of those already in operation on the American side. Some of these early elevators were also operated by horsepower and they were generally of small size, 25,000 bushels capacity being considered a large elevator in those days.

Practically all grain was handled through those early facilities until about 1900, when the railroads were required to supply grain loading platforms, since when the grain producer in Western Canada has had the option of loading his grain direct into cars himself and in that way if he so desires, he could dispose of his grain with only a small commission between the price he receives and the price paid by the miller or the exporter.

Until about 1900, nearly all the grain was bought outright by the wagonload. Since about that year, farmers have had the option of storing their grain, and having it shipped and sold in carloads, merely paying the elevator company a handling charge.

The elevator or warehouse operator bought the grain outright from the farmer. As there was no futures market in those days in Winnipeg, hedging of his purchases was not always as simple as it is nowadays. Fortunately, there was almost always a ready demand for the very fine quality of wheat produced and he generally had no trouble in making sale as soon as the grain was loaded into cars, to the shippers or exporters of those days. He could also contract sale for future delivery, such contracts being guaranteed by a marginal deposit in some bank by both parties. Shippers and exporters in turn would have to accumulate shipping quantities which they would sell as soon as possible to eastern millers or overseas.

It speaks well for our Pioneer Grain Trade and the service they rendered, that there were comparatively few complaints in those early years. Western Canada was a new country, and grain growing and marketing were expanding rapidly. There was considerable hazard in providing the needed facilities which were small and comparatively expensive to operate. Volume that could be handled in many cases was light. Lack of adequate hedging facilities, high transportation costs, all made for a relatively wide margin between the price received by the producer and the price at which the grain sold in overseas market. However, by the end of this period, facilities in all respects had improved to such an extent, and competition had increased to such a point, that these margins had already become fairly moderate.

I believe it can be said of this period, that although the cost to the producer was relatively high, it was not any more than might have been expected under the conditions of the time. Our wheat was being introduced to the importing world and a reputation being built for the sale of our wheat that has always provided ready buyers at a premium over other sorts. Surplus crops were fully sold and prices realized were such as supply and demand conditions justified.

NEW PERIOD USHERED IN

In February, 1904, there was established in Winnipeg by members of the then Grain Exchange, the Winnipeg Grain & Produce Exchange Clearing Association. With minor changes, this association has continued to this day. The organization of this association ushered in a new period in our Grain Trade history. The facilities which it provided soon helped the Winnipeg Exchange to become a world market. Under the conditions which existed previously with restricted hedging facilities, merchants

could only operate in a small way. The new futures market permitted a much larger scale of operations with less hazard and, therefore, made for lower costs, helping materially to reduce the margin between the producer and the ultimate consumer.

Much has been said about futures trading. It has frequently been the basis of attack by agitators who were completely ignorant of its uses and benefits and chose to misrepresent it as speculation because a limited amount of speculation is done under the system, when, as a matter of fact, its purpose and operation is one of insurance and of reducing hazards in the Grain Trade.

You are well aware of the complete and favorable endorsement of the futures market made by the Royal Commission of 1923, headed by Judge Turgeon, and the more recent one of 1931 headed by the world famous economist, Sir Josiah Stamp. I will touch upon this subject a little further, later in my discussion.

From 1904 to 1923, there was a very rapid expansion in Western Canada, railway facilities were extended to all parts of the west, settlers poured into the country, elevator and grain handling facilities increased and improved to meet the growing needs aided by an influx of capital and experienced operators and merchants from Eastern Canada and the United States. Great modern terminal elevators were built at the lakehead, at transfer points, at seaboard points and at some interior points. Great mills were built at strategic points. The railways improved their equipment, and lake carriers kept pace with new and large capacity steamers. Nowhere in the world have the physical means of handling grain reached greater perfection than in Canada during this period.

As the grain business expanded, there was increasing competition. Very few points in the west had less than three or four elevators competing for the business. A number of the milling companies operated large lines of elevators. There were commission merchants and track buyers to compete for carload lots. There was keen competition on the part of shippers, exporters and mill buyers for the offerings on the Winnipeg market. Farmers' Co-operative Companies, under capable management, had developed to large size and competed actively in all branches of the Grain Trade. Under these conditions, the wide margins existing in earlier days soon disappeared and it is safe to say that the latter part of this period found the spread between the farmers' price in Western Canada and the consumers' price in Canada and

elsewhere, reduced to a minimum, I am sure closer than in any other exporting country.

The system of marking worked so satisfactorily, there was no difficulty in disposing of the increasing volume of production. The fine quality of our wheat made for a hungry demand and our better grades sold at a premium over the best competing qualities. Supply and demand conditions governed prices, and generally these were found satisfactory. In years of large supply they were usually moderate, in years of short supply, high. Western Canada was generally prosperous.

Based on the most proven methods of handling and merchandising developed over centuries, the Grain Trade in Canada had reached about the ultimate from the standpoint of service and cost. In no business were there better safeguards to the producer, both from internal regulation within the Grain Trade itself and by Government supervision and regulation through the Board of Grain Commissioners. The normal decline in prices following the high prices of the war period, created dissatisfaction among some of the producers and inspired by a misconception of Government control and operation, a new theory of marketing was born.

THE PERIOD OF GOVERNMENT CONTROL

Before dealing with the new theory of marketing, better known as pool selling, it is necessary to touch upon what I have chosen to call the third period in our Grain Trade history—the period of Government control during a part of and immediately following the war period from August 1st, 1917, to July, 1919, under the Board of Supervisors, and from August 1st, 1919, to latter part of August, 1920, under the Wheat Board.

The Board of Supervisors was primarily for the purpose of gathering wheat supplies for the Allies. A perusal of the orders and announcements of the Board, to my mind, largely confirms this. The Grain Trade certainly did not desire it. Its operation interfered seriously with the business of many of the grain firms. The producers had not wished it, never before had the farmers in Western Canada such reason for satisfaction with the prices that were current. The inauguration of this Board was purely and simply a war measure, and as such, it was accepted by all interests and met with their co-operation.

The most important change brought about by this Board was the suspension of futures trading and the fixing of a definite price in agreement with the allied countries. Beyond this the facilities of the trade were used to the fullest extent possible. The

machinery of the Grain Trade was to be disturbed as little as possible and operations of the Board to be discontinued as soon as possible after the war.

The war ended in November, 1918. With the war over, there was no justification for a continuance of Government control beyond the end of that season. It was in the interest of and only fair to the producer that prices be allowed to reach levels that supply and demand conditions of the time justified. The Grain Trade was anxious to resume its normal functioning, and negotiations were opened with the Government by its officers for the opening of the Winnipeg Grain Exchange early in the summer of 1919. On July 7, 1919, the Acting Minister of Trade and Commerce announced that the markets would be opened. On July 21, 1919, the market was opened, but a few days later it was closed. Unexpectedly on July 31, 1919, the Government at Ottawa issued an order in council appointing a Wheat Board to handle the crop of that year.

Why was the market closed? Why was control continued at a time when the war was over, when a hungry demand for supplies was assured from allied, neutral and enemy countries at high prices? These questions have never been satisfactorily answered. The move was quite unjustifiable. The evidence of the time creates at least a fair suspicion as to the reasons behind this move. It was neither in the interest of the producer or of the trade.

The new Board carried on operations along very similar lines to that preceding it. The futures market was closed but otherwise the facilities of the trade were used to the fullest extent possible; however, there was this difference, instead of a fixed price, the Wheat Board was instructed to sell the crop of 1919 "at a price which would bring the greatest possible benefit to the Dominion as a whole". This, in a true sense, was a compulsory pool. Prices during the period of both these Boards were high.

The producers were represented on both these Boards. Through a misconception that these Boards were responsible for these high prices, was inspired the later move for a renewal of Wheat Board operation and on that failing, the turn to a voluntary system of pooling.

What are the facts? Time does not permit me to go into these as fully as I would like. What was the situation in respect to supply and demand? Russia and Roumania who, between them, exported 170 million bushels of wheat in 1912-13 and about 179 million bushels in 1913-14, because of war conditions, were unable

to supply anything in 1917-18, 1918-19 and 1919-20. In spite of the handicap of distance, Argentina and Australia together exported 155 million bushels in 1917-18, 235 million in 1918-19 and 261 million in 1919-20. The United States exported 132 million in 1917-18, 286 million bushels in 1918-19 and 220 million bushels in 1919-20. Canada 169 million bushels in 1917-18, 104 million in 1918-19 and only 93 million in 1919-20. France producing normally 300 million, produced 134 million in 1917, 225 million in 1918 and 182 million in 1919. Belgium, producing normally about 15 million, produced about 5 million in 1917, about 5 million in 1918 and about 10 million in 1919. Italy, producing normally about 190 million, produced 140 million in 1917, 183 million in 1918 and 170 million in 1919. Great Britain, because of special efforts, produced 64 million in 1917, about normal; 93 million in 1918 and 69 million in 1919. World's production, excluding Russia and China of over 3 billion pre-war, declined to 2,329 million in 1917, 2,800 million in 1918 and only 2,689 million in 1919. The British and Allied countries in Europe were compelled to ration foodstuffs and for a time, even the United States limited the use of wheat flour. In the year after the war, production in all European countries was still on a war basis and to the requirements of the allied and neutral countries, were added those of enemy countries. Predictions of a world's wheat shortage were being freely made. Can there be any doubt of the deficiency of supply and of the urgency of demand?

What of prices? High prices ruled in the spring of 1917. The average price of one northern in store Fort William during May was \$2.72 $\frac{5}{8}$, during June \$2.46 $\frac{1}{2}$. From \$2.20 on the third day of July, it rose to \$2.48 on July 20th, on which date the Board of Supervisors fixed a maximum of \$2.40. This caused a temporary recession to a low of \$2.34, until the later order of the Board made \$2.40, also a minimum to Aug. 31st, 1917. Notwithstanding the grave supply situation which must have been evident in the fall of that year, a price of \$2.21 per bushel was fixed by the Board from Sept. 12th, 1917, to Aug. 31st, 1918, and for the following season from Aug. 26th, 1918, to Aug. 31st, 1919, at \$2.24 $\frac{1}{2}$ per bushel. With the short supply situation of these two years, who can say how high the price might have gone under normal functioning of the Grain Trade and the futures market? \$3.00 to \$4.00 per bushel for one northern wheat might easily have been obtained, perhaps even higher.

You will remember the market was opened on July 21, 1919, for a few days. During those few days October wheat, which opened at \$2.20 per bushel, advanced to \$2.45½, closing at that price on July 28th, when the market was again closed.

The Wheat Board made an interim payment of \$2.15 and with later payments, a total of \$2.63 per bushel basis one northern, store Fort William. Sale prices to Canadian mills averaged about \$2.74 per bushel, which would indicate Canadian consumers paid more for their wheat than foreign consumers. The average closing prices for best quality of dark one northern, which would not average any better than our one northern wheat, was \$3.04 per bushel on the Minneapolis market during the same period, or 41c per bushel more than paid by Wheat Board. On the Chicago market cash prices touched the following high points: July, 1919, \$2.70; August, \$2.58; September, \$2.85; October, \$2.88; November, \$3.22; December, \$3.50; January, 1920, \$3.50; February, \$2.78; March, \$2.90; April, \$3.05; May, \$3.54; June, \$3.13; July, \$3.00 and August \$2.86. They have nothing in that market of better milling quality than our average one northern. In England, wheat sold as high as 135 shillings per quarter, equivalent to over \$4.00 per bushel. An open market was re-established on the Winnipeg Grain Exchange on Aug. 18, 1920. The average price on one northern during the balance of that month was \$2.74 per bushel, or 11c over the price paid producers by the Wheat Board, notwithstanding that by that time world's supply conditions had materially improved. How in the name of common sense can anyone say that these Boards brought the producers better prices or constituted a better marketing system? Can there be any doubt that the reverse was the case?

I have already referred to the period of declining wheat prices following discontinuance of Wheat Board operations in 1920 and the dissatisfaction which this created, resulting in efforts to resurrect the Wheat Board. The open market and futures trading were blamed for the decline by at least some of the producers and their leaders.

What were the facts? First let us deal with the supply and demand situation:—

World's crops ex Russia and China:—

1919 - - - - -	2,689,000,000	bushels
1920 - - - - -	2,864,000,000	"
1921 - - - - -	3,085,000,000	"
1922 - - - - -	3,137,000,000	"
1923 - - - - -	3,463,000,000	"
1924 - - - - -	3,061,500,000	"

You will see there was a consistent increase amounting to an increase of 800 millions in 1923 over 1919.

Canadian exports of wheat:—

*1919-20 - - - - -	92,000,000	bushels
1920-21 - - - - -	166,000,000	"
1921-22 - - - - -	184,000,000	"
1922-23 - - - - -	278,000,000	"
1923-24 - - - - -	346,000,000	"
1924-25 - - - - -	193,000,000	"

Europe, the world's big importer, produced:—

1919 - - - - -	887,000,000	bushels
1920 - - - - -	946,000,000	"
1921 - - - - -	1,214,000,000	"
1922 - - - - -	1,043,000,000	"
1923 - - - - -	1,261,000,000	"
1924 - - - - -	1,059,000,000	"

*Wheat Board year.

Do not these figures speak for themselves? Prices during 1917-18-19 and 20 were high. They should have been higher during the first three of these years. It was but reasonable to expect that they could not continue on that basis indefinitely, and that as soon as the war was over and more normal conditions of supply and demand had been restored, prices would return to a more normal basis.

The average price for one northern wheat, store Fort William, during the season of 1912-13, was 89 $\frac{3}{8}$ per bushel and for 1913-14, 89 $\frac{1}{2}$ c per bushel. For the years referred to they were as follows:

1920-21 - - - - -	\$1.99 $\frac{3}{8}$	per bushel
1921-22 - - - - -	1.29 $\frac{1}{4}$	" "
1922-23 - - - - -	1.10 $\frac{1}{2}$	" "
1923-24 - - - - -	1.04 $\frac{1}{2}$	" "

Due to the short crop of 1924, they had risen to \$1.51 by Aug. 2nd, 1924, before the pool experiment really got underway. With these facts before us, can it reasonably be said that our market did not function satisfactorily? It is well also to keep in mind that

our crops were sold, and no large surpluses were accumulated to depress the price of future crops.

THE POOL EXPERIMENT

We now come to the fourth period to which I have referred as the "Great Pool Experiment". It is impossible in the short time available, to give you the full details of the pool's organization and operation. The failure of the movement for restoration of a Wheat Board through refusal of the necessary legislation in Manitoba, in the spring of 1923, was followed by a whirlwind campaign in Alberta during the summer of that year, resulting in the organization of the Alberta pool. This pool commenced operations in the fall of 1923. The movement was slower getting underway in the other two provinces and it was not until the fall of 1924 that the Saskatchewan and Manitoba pools commenced operations. These three pools organized the Canadian Co-operative Wheat Producers Limited, which was the Central Selling Agency for all three.

The members were all securely bound by a five-year contract to deliver all their surplus wheat to the pool. Elevators were built or acquired at practically all points, terminal elevators were built or acquired at Fort William, Port Arthur, Vancouver and other points. In addition to the Central offices, selling offices and agencies were opened in Eastern Canada and in importing countries. The wheat was to be delivered to their own country elevators, shipped to their own terminals and sold direct to the mills in Canada and overseas by their own men. That was the method to be pursued. Claiming a sign-up of over 50 per cent. of the producers, it was aimed to revolutionize the Grain Trade in Canada and the world, with the eventual elimination of the existing competitive system. Specifically the following objectives were to be attained:—

1. So-called Orderly Marketing, with which must of necessity be coupled the belief that better prices could in that way be attained.
2. Elimination of middleman profits and expenses, which would be returned to the growers.
3. To eliminate speculation.
4. To stabilize the wheat market.

First, with regard to orderly marketing and price effects. A comparison of actual deliveries of wheat in the years prior to operation of the pools and the years of pool operation, do not show any

change of importance in country marketings, allowing for climatic conditions and size of the crop. Such well-known economists as Dr. James E. Boyle, Professor of Rural Economics, Cornell University, and Mr. Sidney S. Gampell, of London, England, have pointed out the fallacies of this theory.

In my humble opinion, orderly marketing does not require regularity of delivery, so much as the selling of each year's crop in such a manner as will realize the best average price, consistent with a reasonably complete disposition of the crop. That they failed in this is best illustrated by the extent of the accumulating carry-overs at the end of each season:—

August 1, 1925 ----	30 million bushels
" 1, 1926 ----	40 "
" 1, 1927 ----	53 "
" 1, 1928 ----	92 "
" 1, 1929 ----	127 "
" 1, 1930 ----	127 "
" 1, 1931 ----	140 "

The carry-over in the previous five years averaged about 33 million bushels, including a carry-over of 48 million bushels on Aug. 1st, 1924, following the very large crop of 1923 and the low prices of that season. Prior to those years, carry-overs in Canada averaged even considerably less than this figure.

With regard to prices. Records show the following average closing price for each season on one northern wheat store Fort William on the Winnipeg market, starting with the first year of full pool operation in 1924 and including the three years immediately following failure of this experiment, the low level of which the pool experiment, I believe, was largely responsible for:

1924-25	approximately	\$1.68 $\frac{1}{2}$
1925-26	"	1.51 $\frac{1}{4}$
1926-27	"	1.46 $\frac{1}{8}$
1927-28	"	1.46 $\frac{1}{4}$
1928-29	"	1.24 $\frac{1}{8}$
1929-30	"	1.24 $\frac{3}{8}$
1930-31	"	.64 $\frac{1}{4}$
1931-32	"	.60
1932-33	"	.54 $\frac{1}{4}$

This record in itself was bad enough but, unfortunately for the members of the pools, they did not receive these prices. They were actually paid the following net prices:—

	MANITOBA	SASKATCHEWAN	ALBERTA
1924-25 - - -	\$1.617	\$1.617	\$1.63
1925-26 - - -	1.43	1.4108	1.425
1926-27 - - -	1.377	1.371	1.385
1927-28 - - -	1.378	1.374	1.387
1928-29 - - -	1.135	1.141	1.145
1929-30 - - -	1.00	1.00	1.00

Reduced to 85c on June 25th, 1930.

On top of this, the three Provincial Governments had to assume a very large indebtedness to the banks, amounting to something like twenty-five million dollars.

In 1924-25, out of 304 market days, there were only 112 days when the market closed lower than the prices paid by the pools to their members. In 1925-26, out of 301 market days, there were only 57 days when the market closed lower. 1926-27, out of 302 market days, there were only 47 days when the market closed lower. In 1927-28, out of 303 market days, there were only 22 days when the market closed lower. In 1928-29, out of 302 market days, there were only 16 days when the market closed lower, and in 1929-30, there were only 4 market days when prices closed as low as those paid by the pools. Need more be said?

Secondly. Elimination of middleman's profit and expenses, which would be returned to growers.

What did they eliminate? Nothing—on the contrary the result was the reverse. No organizations in the Grain Trade were eliminated. The Pools became members of the Grain Exchange and used its facilities to a considerable extent as suited them. The old machinery of grain merchandising continued operating just as before. Government machinery for inspection and weighing and for supervision of the trade, remained as before.

What, then, were the changes made to handle a portion of the crop which the existing machinery would have handled better and without the severe consequences which followed this experiment? Large staffs had to be organized at Winnipeg, Regina and Calgary, with branches and agencies elsewhere, which, including the officers, represented an actual expense of probably about one-half cent per bushel on their handling which, during the period of seven years, would amount to an approximate sum of \$5,900,000.00. This expense could easily be done away with and,

therefore, is not so serious. What is serious, however, is the over-expansion of elevator facilities which resulted. In the years 1924-1930 approximately 1,750 elevators were built which, to a large extent, represented duplication of facilities. These represent an investment in the neighbourhood of \$21,000,000.00. It means, of course, that the crop to be handled must be spread around amongst more elevators. The average number of bushels handled is bound to be less and the operating expense can change only slightly. The cost of handling per bushel is on the whole, therefore, increased over a long period of time. This will be a very considerable item. Additional terminal facilities were built. These, because of the conditions created, were needed. In most cases, without the pool experiment, the existing facilities would largely have sufficed. This, therefore, represents another source of increased cost on the whole that some one must pay. The additional expense involved in these increased and unnecessary facilities does not fall altogether on the producers. It has had the effect of making profitable operation of these facilities difficult.

Third. To eliminate speculation. You already have listened to two splendid addresses in respect to the price insurance system, known as grain futures trading, and with regard to what is termed speculation, by Dr. Taylor of Stanford University and Mr. Sanford Evans. The importance of grain futures trading in the grain marketing machinery has been adequately pointed out to you by them. You have been given the results of special enquiries by Royal Commissions on more than one occasion, and I do not feel, therefore, that it is necessary for me to touch extensively on this subject.

Prior to organization of the pools, there had been a growing sentiment against speculation, because of the belief that it had an adverse effect on prices realized by producers. This, I believe, has been amply disproven. If I might make an observation, it is this. From my experience, it is my belief only a very moderate percentage of the futures trading could be classed as of the speculative type, and of this I believe over ninety per cent. of the time purchases are made first. The buyers become owners of actual grain and the later selling in such cases is perfectly legitimate. Relatively only a very small percentage of speculative trades are sales first and even in these cases, the grain must later be bought in. It will be seen that, as a class, speculators are first buyers. This is overwhelmingly the case. How, therefore, can they be an unfavorable influence? The evidence insofar as the great mass of

speculative trading is concerned, is that it is definitely beneficial and constructive and not harmful to the producer. The greatest volume of speculative trading has always been during bull market periods. The speculator as a class is an optimist and a price booster for the farmer.

The futures trading market has been likened to a barometer. Supposing the Winnipeg market were closed, what would happen? Would not speculative trading merely be diverted to other markets, and what is far more important, would we not be compelled to sell our wheat on a basis of some foreign market, under foreign control? Take Liverpool, for instance, a relatively low quality wheat delivery market and, therefore, a low price market. The Winnipeg market, on the contrary, is a Canadian market, a high quality spring wheat market—the highest priced export wheat market in the world.

In your dictionary you will find "Pool" defined as "A common fund or combination of interests or persons for speculating in or manipulating the market price of securities, grain, etc". Could any other description be nearer the truth? Has not their operation been the greatest speculation we have ever known, with their policies of withholding grain from the market and building up increasingly large carry-overs? The impossibility of hiding such large scale operations, their methods of selling, all these could not help but have an adverse effect on the world's price structure. In the interests of the producer and all concerned, let us pray that the correction of the results of this experiment is not too long delayed and that it will again be possible for the futures market here to perform its normal service in all respects.

Fourth. To stabilize the wheat market. The best evidence of their success or failure in stabilization of prices is the actual record of prices during the period of pool operation. With the exception of the war and immediate post-war period, there was no time since our futures market started operations, that fluctuations have been greater. I have already given you a record of average prices each year during this period. These records certainly do not indicate stabilization.

To summarize, not only did the pools completely fail in their aims and objectives, but their methods and policies must be held responsible for the development from which we have not yet fully recovered. The organization of the wheat pools was too large and cumbersome. This did not make for efficient operation. Too large a quantity of wheat was in the hands of one seller. The

actions of the organization could not be hidden. Their selling operations in all markets, therefore, had an abnormally bearish effect on prices.

Their members realized prices below those obtained by other producers. Much worse, however, was the effect their operations had on Canadian and world's price levels. The policy of withholding wheat and the accumulation of burdensome carry-overs was especially damaging.

Wheat is more widely grown than any other food product. It is a key product, if anything can be classed as such. Policies which have a bad effect in Canada are bound to have a world effect along the same lines. I believe that the wheat situation of recent years has been due to pool operations and has had much to do with the extent, severity and length of the depression from which we are not yet entirely free. Our best customers, the buying countries of Europe, were antagonized and became alarmed. It appears to be no mere accident that tariffs on wheat were sharply raised in 1929 and 1930 with other restrictions by such countries as France, Germany and Italy, forcing increased production and the use of substitutes to the extent that these countries now produce about sufficient wheat for their own needs.

Through over-expansion of country and terminal elevator facilities, a smaller volume of handlings has been brought about. This will make for an increased cost per bushel in the operation of these facilities to the detriment of the producer and the owner. Pool marketing of wheat was but another demonstration of the fallacies of that method of marketing by either private or Government control which has been so amply demonstrated many times before in other commodities such as coffee, sugar, rubber, etc.

THE FIFTH PERIOD

The fifth period covers the time from the fall of 1930 to August 31st of this year. With completion of the 1930 season with the very large surplus of approximately 127 million bushels, the pools found themselves in a position where they could not carry on. Guarantees which the Provincial Governments had given to the banks left these Governments in a serious position, large losses were staring them in the face with the grain still to be liquidated and another crop coming on the market. In their dilemma both the pools and the Provincial Governments appealed to the Dominion Government. After some negotiations the Dominion Government agreed to guarantee the banks against loss

on the new crops. The pools released their members from their contract obligations and agreed to carry on operation of their elevator systems on a regular line elevator basis, by hedging all purchases. The Provincial Governments retained a mortgage on the properties of the pools as security for the obligations assumed. Mr. John I. McFarland was appointed general manager of the Central Selling Agency, which ostensibly continued as part of the pool organization but actually became a Government instrument. Under this arrangement, the carry-over of wheat taken over from the pools was to be liquidated as early and as advantageously as possible and the Canadian Co-operative Wheat Producers was to function as a stabilizing agency until liquidation had been completed and more normal conditions had been restored.

There appears little doubt that some action by the Federal Government was necessary to prevent what otherwise might have been a complete debacle. The situation in Canada was naturally well known to European buyers who were antagonistic as the result of pool policies. Prices in the fall of that year had reached a point where it was no longer a matter of price. European buyers would only buy from hand to mouth as needed and speculative interest had been almost completely destroyed. Under the circumstances only the Federal Government could step into the breach and provide the necessary support.

Under the conditions which existed at the time, I believe there were very few in the trade who did not welcome Government intervention. It was not expected that this intervention would be for long if the basis on which it was established was followed out. Unfortunately, however, this did not prove to be the case.

The intention was that the normal functioning of the Grain Trade was to be interfered with as little as possible. The facilities of the Winnipeg Grain Exchange were to be utilized, including the futures market, to buy as was necessary, and it was intended to sell in the same market. Until this year, operations were largely confined to the futures market, a perfectly legitimate method, this being the most efficient and economical way in which it could be handled. Delivery of cash grain was taken at times, but this was generally disposed of as soon as possible. Only in the present year have extensive deliveries of cash wheat been taken, the greater part of which was on hand at September 1st, when the new Grain Board legislation became effective.

The only other feature in connection with operation of this agency, of which mention should be made, is the placing of a

minimum price on wheat early in October, 1934, this policy being followed during the balance of the season.

The results of this period can best be shown by giving you some further statistics:

Average Prices of One Northern in Store Fort William

1930-31 - - - - -	64½c	Low point Dec. 16, 1932 (close)
1931-32 - - - - -	60c	39½c
1932-33 - - - - -	54½c	
1933-34 - - - - -	68½c	High point Aug. 9, 1934 (close)
1934-35 - - - - -	81¼c	94c

Carry-over in Canada

Aug. 1, 1930 - - - - -	127,000,000 bushels
Aug. 1, 1931 - - - - -	140,000,000 "
Aug. 1, 1932 - - - - -	138,000,000 "
Aug. 1, 1933 - - - - -	219,000,000 "
Aug. 1, 1934 - - - - -	204,000,000 "
Aug. 1, 1935 - - - - -	215,000,000 "

Exports

Season	Canada	Argentina	Australia
1930-31 - - - - -	259 million	124 million	154 million
1931-32 - - - - -	207 "	140 "	154 "
1932-33 - - - - -	264 "	131 "	154 "
1933-34 - - - - -	195 "	147 "	90 "
1934-35 - - - - -	166 "	178 "	112 "

While carry-overs in Canada increased from an excessive amount of 130 million bushels on Aug. 1, 1930, to 215 million bushels on Aug. 1, 1935, Argentine carry-overs only increased from 35 million bushels to 50 million bushels and Australian from 28 million bushels to 47 million bushels during the same period. These carry-overs are not far from normal for the Argentine and Australia, as the season in those countries does not end until December.

Small wheat crops were produced in Canada, the United States and Australia in 1933 and 1934, and the advance in prices in the seasons which followed can largely be attributed to that fact. I will let the other figures speak for themselves.

A NEW ERA

Since September, we have been in a new period. A Government Grain Board has taken over all operations of the Canadian Co-operative Wheat Producers, and a minimum price has been

guaranteed to producers. Following the recent election, the new Government on Dec. 3rd, made a change in personnel of the Board and the Honourable W. D. Euler, Minister of Trade and Commerce, made the following statement:—

"The concentration of surplus stocks of wheat in Canada during the past few years, has created an abnormal situation in the world wheat trade. Last June this situation was recognized by parliament as not being in the interests of Canada or her wheat producers, and the Dominion Government desires to have our surplus restored to a normal basis. To accomplish this, the Wheat Board will seek the goodwill and co-operation of the Grain and Milling Trades in all importing countries. It is not necessary to have, and there will not be any 'fire sale' of Canadian wheat, but it will be for sale at competitive values and will not be held at exorbitant premiums over other wheats".

Gentlemen, I hope and believe this marks the beginning of a return to more normal functioning of the Grain Trade, more satisfactory average prices to our producers and of a more prosperous condition in Western Canada.

QUESTIONS AND ANSWERS

Question—I believe the Argentine set a fixed price and are at the same time shoving their wheat on the world's market at the world price. Did Canada ever pursue that policy and would it be the best policy to pursue, at least from the farmers' point of view; that is a fixed price internally but a world price externally?

Answer—There has not been a fixed price in the Argentine but a minimum price and the same policy as far as producers are concerned has pretty much been in effect in Canada since September of this year.

In the Argentine they have had this minimum price now for some years but that has not been the full extent of the protection afforded to farmers in that country, as in addition to the fixed minimum, the Government has also exercised a control over exchange and has maintained the peso at a considerable discount under its normal parity. This has at least to some extent provided the Argentine farmers with additional protection. In Australia there have been various methods of protection to the farmers. In the past year, I believe, they have directly subsidized the farmer, but in addition to that the farmer also benefits through

Government control of exchange, Australian sterling being at a considerable discount under English sterling. The past few years, Argentina and Australia have been our chief competitors in foreign markets and as long as they pursue such methods of subsidizing their farmers and as long as conditions are not normal in importing countries, I feel that it is good business for our Government to offer some method of protection to our farmers, but I feel that in all circumstances such protection should not interfere with our selling policy ; that we must be prepared to sell our wheat competitively on the world's markets. I believe that we in the Grain Trade should assume some leadership in seeing that our farmers in Western Canada are given some measure of protection until more normal conditions rule and that sound merchandising policies should be followed in the selling of our crops.

In Canada we have not chosen to extend protection to our farmers by control of exchange. In starting stabilizing operations in 1930, it was undoubtedly for the purpose of extending some measure of protection to the farmers, in view of the extremely abnormal conditions which existed at the time. Unfortunately, these operations were not carried on as had been anticipated. Starting at around 60c, prices were allowed to decline to below 40c per bushel for One Northern at Fort William. This hardly provided anything in the way of protection for the farmer. Then when conditions of supply and demand, through serious crop damage, resulted in a considerable price advance, an adequate selling policy was lacking.

We have to keep in mind that conditions in Europe are not yet normal. High tariffs which were introduced, increased production and the use of substitutes which resulted, were to quite a large extent, I believe, the result of our policies. France, Germany and Italy were amongst our chief customers. At the present time these countries are almost self-sustaining, but the price of wheat in these countries is very high. It would no doubt be more satisfactory to them to cheapen the cost and improve the quality of their bread by importing some of their requirements, in return being able to sell such goods as they are able to produce more satisfactorily. This situation cannot be corrected in a matter of days, or months. It may take years. Our Government has been following a praise-worthy policy in the matter of trade arrangements with foreign countries, but there is still a lot to do. One thing is sure, if we are going to sell our wheat, we must meet the competition of countries which are our direct competitors ; and if

we are not to commit slow suicide in this country, we must make it possible for our farmers to be able to keep on producing grains on the basis that will bring them a fair return. This, I believe, is in the national interest, as well as of the farmers and the Trade.

Question—Not that I wish to defend past Governments, but there is one point I really take issue with Mr. Gauer on, and I wonder if he has given much thought to it. Has the Government in withholding our wheat been rather responsible for France, Italy and others building up their wheat reserves? Do not the papers we have been reading prove to us ninety per cent was racial hatred? Was not this caused after the last war, by the cutting up of different countries and girding themselves for the next scrap? Italy is without oil. If she could persuade farmers to produce oil, she would be subsidizing that. The difficulty is intense nationalism rather than any policy which might have been pursued by any Canadian Government.

Answer—There is no doubt nationalism has been a little overdone in some of the European countries, but I think it is very significant that it was in 1929 when the pool were going to hold wheat for \$2.00 a bushel, after they had been sending their men to the other principal exporting countries of the world with the idea of organizing farmers to hold up prices, to secure the prices they were aiming at, that the first big increase in these tariffs occurred. Now if you look back to the period after the war, in the case of Germany, the situation was tremendously more difficult. You will remember that with the inflation they had in that country, wheat was extremely costly to those people at that time, yet they bought wheat. They did not start a policy of high tariffs and restriction of imports until about 1929, which was some time later.

Question—I do not really want to ask a question of Mr. Gauer, but if he will permit me to do so, I will supplement the statement by showing another thing which aggravated the situation. In 1929 the United States passed the Farm Board Act. That also contributed to it and that Farm Board Act was passed on the suggestion and through the guidance of Canadian pool leaders.

Answer—I should perhaps have added in my remarks that it was the Farm Board policy in the United States, with its appropriation of \$500,000,000 to artificially hold up prices, that helped greatly to bring things to a head. If it had not been for this action of the United States, the developments and the disastrous

prices which followed, might at least have been delayed and perhaps would not have been nearly so serious.

Question—Mr. Gauer has pointed out to us that the cause of the rise of the pool movement was the high prices that were in effect as a result of war conditions. Now farmers, naturally, like ourselves, like to get high prices. When the pools started operating they were able to present to their members their operating costs, say only $\frac{1}{2}$ c a bushel or some fraction of a cent, which sounded very economical, very low operating, but there was nothing to compare that to—no means of criticizing them as to whether they were operating economically or not. Grain firms represented by the members of the Grain Exchange, in competition with each other, were not able to present to the farmers of the West precisely what the operating costs to the farmers were on the part of the grain firms.

The point I want to bring out, is the fact that the grain firms were not able to co-operate among themselves to present to the farmers of the West the true picture which they could have presented if they had some method of co-operation to bring their point to the attention of the farmers. If I am not clear in my explanation, I would be very glad if you will indicate it to me.

Answer—I think you are partly correct. As far as the Grain Trade is concerned, you will remember that there have been co-operative companies operating in all branches of the Grain Trade for many years prior to pool organization. These companies were efficiently managed and their reports at the end of the year were available to the shareholders and I believe they were generally published and in that way were available to the general public. A great many of the farmers must have been aware of just what expense was involved in the handling of their grain. Insofar as the pools are concerned, I have not seen all their reports and I do not know what they reported. I do not know whether they were ever able to arrive at their proper expenses and costs of operation. They had no cost basis to start with and paid no interest on monies held back on farmers' deliveries. I do not see, therefore, how they could really have supplied a proper statement, one that would be comparative.

It has been one of our great failings. I might say it has been a sin of omission. We have not sold ourselves well enough, and we have permitted developments that should have been more aggressively fought—developments that we should have seen

were not in the interests of the farmer. I think it is the duty of this Exchange and of the Trade, to guard against such uneconomic developments in the Grain Trade. I think to a considerable extent we have overlooked the fact that in trying to serve ourselves, we must first serve the farmer. We are anxious that the farmer shall be able to produce in a normal way, that he shall get fair prices and that best methods shall be followed. In other words, our interest as well as our hope is that the farmer prospers.

Question—Mr. Gauer referred to some of the early grain co-operatives, such as the Saskatchewan Co-operative Elevator Company, as having been very successfully and efficiently managed. I wonder if he could tell us why that same calibre of management was not available to the later pools?

Answer—I believe that efficient management was available to them if they had been willing to pay the price and allowed the management to pursue proper merchandising policies. The operations and policies of the pools were controlled by a board of directors who, insofar as grain merchandising is concerned, were a lot of butchers, bakers and candle-stick makers. Of course in the first place, policies were not sound and I do not care who the management had been, if they had followed out those policies, I believe, they would have come to grief sooner or later.

Question—Of the amount the Government assumed of the pool losses, I understand a certain percentage has already been entirely written off. They are carrying in their revenue bearing accounts part of that loss and receiving interest on it. Could Mr. Gauer tell us what percentage has been written off altogether as a dead loss?

Answer—I have read a report of it in the paper at some time. I do not know the exact figures off hand but I know it was a considerable sum.

Question—Could you tell us what became of the huge surplus of the American Farm Board? What became of that huge surplus and how did they get rid of it any more than we can get rid of our huge surplus here?

Answer—I could not tell you off hand all they did over there. One of the main methods of disposing of their surplus was to give it away, distributing it for food and feed through the Red Cross. I saw a report recently, I do not recollect the exact figures, but out of \$500,000,000 originally appropriated by Congress, I think

there was only about \$100,000,000 that they had any hopes of getting back and of this difference somewhere in the neighbourhood of \$200,000,000 was lost in their wheat stabilizing operations.

Question—Supposing during the last five years Canada had sold her wheat in competition with other export wheats of the world and our carry-over might be down to nearly 40 million bushels, would the price of wheat be higher today, keeping in mind the war situation and the short crops in many parts of the world?

Answer—I do not think there is any question whatever of that. I think if we had followed a policy of meeting competition but seeing to it our farmers had some measure of protection to meet competitive conditions, we would have had a very much healthier situation and higher prices at this time. Even if the present supply of wheat were in the world, if it were differently distributed I am sure we would have better prices. I think under the conditions we have had these last few years, (we have had practically three very poor crops in Canada and the United States, and now this year we have something approaching a failure in the Argentine), prices should be considerably better than they are at the present time.

Question—At different times the statement is made if we had placed our wheat on the market that our competitors would have reduced their price to meet every instance. Is that Mr. Gauer's belief?

Answer—I do not think so. Take the Argentine—as has been previously mentioned, they have had a minimum price in effect for their producers for several years. Competitive countries would meet our competition up to a certain point, after which history tells us, and we know from our experience in this country, that there is a point at which there is diminishing production. We have had in our Western country some land brought under production which would have been better left alone in pasture. The same thing has occurred, perhaps to even a greater extent, in some of the other countries. Australia put a lot of land formerly used for sheep pasture into wheat. It looks as though in the last few years, due to low prices, that some of this land is again being returned to sheep pasturage. Argentina has done the same thing. That country can turn the land to other production, such as corn. I believe you are all pretty well aware of the amount of corn they have been producing in recent years

and which they seem to have been having no trouble selling. Cattle production is on a very large scale in that country and some of the land now used for wheat might easily be diverted to cultivation of feeding materials for this industry. There is no doubt if we had followed the policy of placing our wheat on the market in the past few years, our farmers should have been given protection in some form, but such action would have started the necessary corrective influence working and the chances are that a very much healthier situation would have existed long before this time.

Question—I do not know whether this is really in line with the questions, but we hear so many questions tonight. If we put on a fire sale would it have gone down to 20c? Look at it in the ideas of a grain firm. For instance, take a country elevator point where there are four elevators. One company goes out and pays 2c over the market. That agent will get all the grain unless the other companies all pay 2c over. Then by mutual agreement, all companies pay the market price next week. Now, if Argentina should sell wheat at 20c less than us and we went on the open world market selling wheat and competing with Argentina and they dropped the price 10c and we followed, they would realize we were going to drop with them and keep on their tail and the chances are the same as in the buying end that we would reach a mutual agreement and get our price back to a decent level. I think if some of these things were tried and experimented with instead of written up in newspapers, we would have a better solution to these questions.

Answer—I think something might be said here. I think in Western Canada we have got as fine a wheat producing land as they have anywhere in the world. I think our farmers as a class, are probably superior to those, at least in some countries like the Argentine—not any worse. We have a climate that seems particularly suited to producing wheat. We can produce a better quality of wheat. We have never had any trouble to get a premium for our better qualities of wheat as compared with the qualities of wheat these other countries have to sell. It is a matter of record our average yields in Western Canada are considerably in excess of what they are in Argentina and Australia. I think our average is something like 17 bushels per acre; Argentina about 14, and Australia only about 11 or 12. Then we have very superior handling facilities. Actually we are a good deal farther from the seaboard than these other countries, but our

transportation and handling facilities are so superior to what they are in these other countries and costs have been reduced to such an extent, that we are able to compete with them. Although our producing sections are a long distance from the seaboard, we have an advantage in that we are closer to the European market. To summarize, we have a lot of advantages and few disadvantages, and if it came to a dog fight, we should not have much trouble in holding our own.

Question—I would like to ask the speaker how is the value of a bushel of wheat determined?

Answer—By supply and demand. To deal with this question adequately would require a lecture in itself. In a general way, it depends probably more on what importing countries, principally in Europe, can afford or are willing to pay. The cost of production in Europe is relatively high, and much of the land there can be used for other purposes to better advantage. Populations are large, with the large percentage devoted to manufacturing and other interests in urban centres, so that consumption requirements in most European countries are quite large. Up to comparatively few years ago, European and other foreign import countries were able to absorb all offerings available from export countries and the price each year depended to quite a large extent on the size of the surplus available for export in surplus producing countries such as Canada, Argentina and Australia.

Question—Is it true the Argentine has no facilities for holding wheat?

Answer—Well, they have not got the efficient facilities we have. Their method is to put it in bags and pile it up under a shed at most country points. At the terminal markets they have some modern plants but that is about the extent of the facilities they have. There is, of course, more risk in storing it in that way, especially in a country like Argentina, because they are troubled more with insects and vermin of one kind or another in a warm climate such as they have there.

Question—Where does Russia stand insofar as wheat is concerned? Are they now on an export basis?

Answer—Russia has always been an enigma. Before the war you could never depend on reports from Russia and the situation at present is not much better. Russia has never had a surplus as far as I know. The only reason they sell wheat is because they

need money to pay for other things. Russia is a potential threat. I noticed a report the other day that Russia is intending to increase her wheat production 50 per cent. They would not export that; they need that in their own country. In one recent year when they exported wheat, there was a report of 5 million people starving to death. Russia in the last few years has exported only very moderate quantities of wheat. They have been moderate sellers this year at a good discount under our better qualities.

Question—Why have European mills reduced their grind percentage of Canadian wheat from about 65% to around 15%, and what would have happened to the Argentine surplus if they had not?

Answer—Well, I think the principal reason they have reduced their use of Canadian wheat is because of price difference. Canada held her wheat for 15, 20, 25 and perhaps as high as 30 cents over other wheats and millers consequently used a minimum of our wheat. In the last few years Canada has had very high grade crops; that is, prior to this year. Canada has been able to supply them with this high grade, only a small percentage of which, mixed with inferior wheats, would bring up the blend to their requirements. And if the flour would produce a loaf that satisfied the people, with a big price difference, naturally they would use as little of our wheat as they could get by with. Had a normal amount of our wheat been used, providing greater competition to the Argentine, the wheat price might temporarily have been somewhat lower. Under these conditions there might have been a lot more of the Argentine wheat gone for feed uses. We know there has been heavy consumption of wheat for feed in recent years. At lower prices the Orient might have been larger buyers. Even if the Argentine had a somewhat larger surplus this last season, ours would have been much reduced and the world's situation would have been much healthier.

Question—During these periods of depression which seem to follow periods of overproduction, it seems to me there are corrective lines. I do not think in my opinion that Governments or pools or anybody else can overcome these periods of depression. What is Mr. Gauer's opinion?

Answer—Well, we never had any difficulty with an oversupply of wheat prior to the days of the pools, not that I know of. They have occurred perhaps in past history, at some time. We have had a tremendously expanding consumption. In Western Canada,

our production grew very quickly and it was all used up as fast as we could produce it. The same thing applies to some extent to Argentina and Australia. The growth of population has been taking care of it to some extent. European countries have been changing from a rural people to an urban people, to a manufacturing people. Their requirements have been larger. There was a constantly expanding market. The great war upset things somewhat and our interference with economic laws in recent years has aggravated the situation. Under normal marketing conditions, I believe, we would not have had these problems, at least not as serious as they have been.

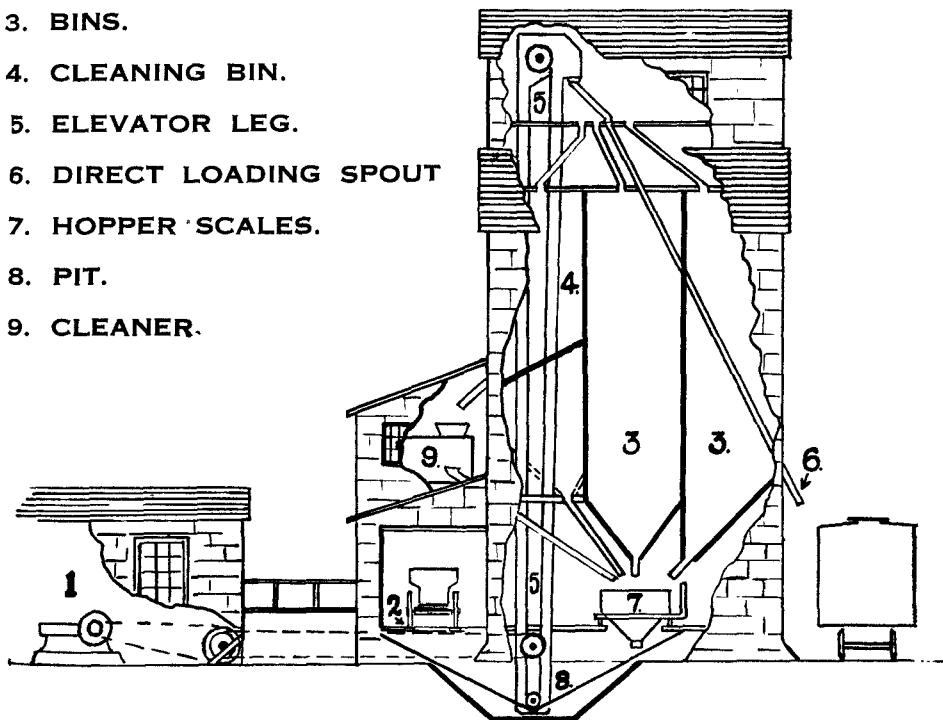
Question—Just what do you mean by “our interference with economic laws? Are you alluding principally to tariffs?

Answer—I am thinking more of withholding wheat and accumulating surpluses. If there is any thing worse in trying to get a fair price, it is by holding back grain. Supposing this year we had a crop of 500 million bushels of wheat instead of a small crop. Put that on top of 200 million bushels carry-over. What would have happened if you did not have the Government there to take it? The very fact of such a surplus and the necessity for Government support is an advertisement to the world of a burdensome supply situation.

Question—You have heard different people mention the Argentine export business and how they have been going along lately. It has been intimated Great Britain has a very large financial stake in the Argentine and they have been moving a lot of wheat from the Argentine, but it is also intimated that there has been a return of trade. In other words, they are working two ways; products from the Argentine to Great Britain and vice versa—more so than has been between Great Britain and Canada. Is it so? We cannot expect to be selling all our grain, minerals and everything else without buying something in return.

Answer—Naturally there must be an exchange of goods or services, except temporarily when capital may be moving into a country for investment. It does not follow that it must be a direct exchange between two countries. It quite often is a three-cornered or four-cornered proposition. Take in our case, Canada normally sells more to the United Kingdom than we buy from them. We generally, I believe, buy more from the United States than we sell to them, while the United States probably buys more from the United Kingdom than they sell to them.

1. ENGINE ROOM.
2. DUMP SCALES.
3. BINS.
4. CLEANING BIN.
5. ELEVATOR LEG.
6. DIRECT LOADING SPOUT
7. HOPPER SCALES.
8. PIT.
9. CLEANER.



Cross-section of Country Elevator

THE COUNTRY ELEVATOR

The committee which is responsible for the selection of the subjects to be discussed with you has asked me to tell you something of the country elevator and how it is operated.

Most persons resident in Western Canada and those who have travelled across the prairies are familiar with the outside appearance of the country elevator. There is a great sameness about them and they have been built without a thought of architectural beauty. I have heard them called ugly warehouses, but I shall try to show they at least are efficient.

When one sees a country elevator being built on some branch line, it marks the successful pioneering efforts of those who have come to that district to live. It is an indication of confidence in the future, not only by the farmer, but by the elevator company that has invested capital in the construction of the elevator and has confidence in the future of the surrounding country.

OVER EXPANSION OF ELEVATORS

Over-confidence in the future of many enterprises has resulted in over-expansion. I do not think it can be denied that we have more than enough country elevators. We could, with a smaller number, efficiently handle Canada's grain. I shall not weary you with statistics but shall give you a few figures showing the very marked increase in the number of country elevators that has taken place, which increase has more than kept pace with increase in acreage.

	No. Elev.	Capacity	Acreage all grain
1920-21	3,789	129 million	30,623,000
1925-26	4,294	141 "	31,326,000
1930-31	5,734	193 "	38,231,000
1935-36	5,718	190 "	36,861,000
Percentage of increase	51%	48%	20%

Country elevators are owned and operated by individuals, private companies, public companies, farmers' joint stock companies, and farmers' co-operatives.

ELEVATOR CONSTRUCTION

Let us consider briefly the construction and the interior of a country elevator. It is most often constructed of wood cribbing set on deep cement footings and covered with sheet metal or wood siding. Its storage capacity ranges from 25,000 to 60,000 bushels, the ordinary standard being about 30,000. It is usually divided into 16 to 20 bins, necessary for the separate storage of various grades. Grain is delivered to the elevator in the shed on the driveway by wagons and trucks. After it has been weighed it is unloaded by dumping into a receiving pit—in more modern houses by the operation of an air dump. The grain when dumped is elevated from the receiving pit to the cupola by a belt, to which is attached metal buckets. From there it is spouted into one of the bins. The operator directs the grain to a particular bin by means of a movable spout, the operation of which is controlled from the workfloor.

In shipping grain from a country elevator the grain is weighed in a hopper, re-elevated and spouted from the top direct into railway cars—newer houses have a spout to the driveway as well. Many elevators in Saskatchewan and Manitoba are equipped with cleaning machinery of various makes and sizes.

Today a modern country elevator of 30,000 capacity costs about \$10,000.00 to build.

AN EARLY TYPE

A country elevator of thirty years ago, with which I was familiar, was owned by my father in Brampton, Ont. It was operated by a steam engine. A long shafting from the engine house operated large gear wheels within the elevator. Grain was delivered in bags. There was a narrow gauge track running from the receiving door to the loading door. On this track a truck was pushed. It would hold about twelve two-bushel bags. The farmer lifted the bags up to a shelf; the elevator operator lifted them to the truck. The truck was pushed to a scale and the grain was weighed, then the bags were emptied into a hopper bin. There were ten bins in the elevator and I have many times been sent up a narrow stair to the cupola to turn a large iron wheel with an indicator to direct the grain when elevated to a particular bin. I have also been sent down the ladder on the side of a bin with a worn out broom to kill rats in the corn. Equipment such as we had then could not handle Western Canada's grain today.

AGENT'S QUALIFICATION

The elevator operator is the agent of the company which employs him, and it is essential in the choosing of an agent that he shall be honest, capable of grading grain properly and well respected among the farmers in his district. He must have a fair working knowledge of gasoline engines and machinery. He must be capable of making out correctly the reports necessary for his head office and the receipts and tickets required by his customers. His business is highly competitive and he requires to be tactful to retain for his company a proper share of business on his market.

Country elevators are licensed under the Canada Grain Act, and I shall refer briefly to some of the provisions of the Act relative to country elevator operation.

The operator or manager of every licensed public country elevator shall, at all reasonable hours on each day upon which the elevator is open, receive all grain offered thereat for storage without discrimination, and in the order in which it is offered, provided that there is in the elevator available storage accommodation for grain of the variety and grade of such grain and of the character desired by the person by whom the grain is offered.

The operator and manager of every licensed country elevator shall afford full facilities to any person by whom grain is delivered to such elevator to verify the correct weight of the grain delivered as the same is being weighed. Under Section 92 of the Act, the weigh scales of a country elevator are subject to inspection at any time by an inspecting officer acting under direction of the Board, and it is a fact that they are examined.

EFFICIENT ADMINISTRATION

The Board of Grain Commissioners, appointed under the Act, has very wide powers to ensure that the provisions of the Act are carried out. I cannot speak too highly of the very efficient and fair way in which the gentlemen who presently constitute the Board administer their duties. Country elevators are obliged to furnish the Board with statements showing receipts and shipments of all grains, and overages which would indicate short weights to farmers would be dealt with by the Board.

You will note from the two sections of the Canada Grain Act which I have read to you, that a country elevator is required to accept grain when offered, and that it must be honestly weighed.

FIVE ALTERNATE METHODS

When a farmer hauls his grain to market he may dispose of it at the country elevator in five different ways:

First—By selling it at the grade and dockage and price as agreed upon with the operator, in which case the farmer is given a cash ticket, which is a form of ticket as directed by the Board, showing gross weight, wagon weight, grain unloaded, shrinkage allowance and gross grain weight. It also shows dockage, net weight, grade as agreed and price per bushel. This ticket when endorsed may then be cashed by the company's paying agent or bank.

Second—By taking an interim cash ticket, which is similar to the first method, except that the grade has not been agreed upon, and is to be determined by a sample, the identity of which is carefully preserved, and sent to a Government grading office for official grade. The price already having been agreed upon, the spreads for grades, other than that specified as the grade expected by the farmer, is the spread existing on the date of purchase.

Third—He may have his grain stored in a special bin, and receive a special bin elevator receipt. The elevator operator in this case must secure an average sample of such grain and have it placed in a receptacle, and dealt with in the manner prescribed by the Board. In case of dispute later as to the elevator operator having kept the grain separate, the sample which will be graded by the Inspection Department governs the grade.

Fourth—He may have his grain graded and stored with grain of a like grade.

Fifth—He may have his grain stored subject to grade and dockage, in which case again, a sample has to be secured and retained for identification and grade.

FARMER THE SOLE ARBITER

With all of these five methods of disposing of his grain, the farmer is the sole arbiter of which method he shall use.

I have attempted to show you that the elevator is required by law to accept a farmer's grain. It is required to give honest weights. It is required to so handle the grain if a grade cannot be agreed upon, that the farmer may have his grain graded by a Government Inspector. It must keep insured the farmer's grain. Everything in the Act dealing with country elevator operation is so worded and interpreted that the farmer's interests are safeguarded.

There is a provision in the Act requiring that each licensee shall provide a bond to the satisfaction of the Board to insure the payment of all sums due by him under the contracts which he has made. This is a further protection to the farmer, provided by the Act.

We have not the time in this talk to enter into a discussion of all the price determining factors which regulate the price at which elevator companies are willing to buy grain from a farmer. I shall, however, unhesitatingly say that the price is the highest possible that keen competition, consistent with good business, can force it. It is a direct reflection of the price the buyers of the world are willing to pay for such grain. Thus world values are worked out all along the line from the consuming market to the country elevator, the value at intermediate points being determined largely by the cost involved in putting the grain there.

In view of the fact that there are five different methods by which a farmer may choose to sell his grain, it is obvious that in some methods the elevator company is required to accept less risks and perform less service. It must be apparent that it costs an elevator company less, and there is less risk involved, in handling a carload quantity of, say, fifteen hundred bushels of one grade, than to handle twenty loads of seventy-five bushels of several grades. This is one of the reasons for the spread between grain sold in small quantities by cash ticket and grain sold in carlot quantities. The very fact that he may elect one of five methods will keep the difference between cash purchases and carlot purchases at a reasonable spread and consistent with the risks to which the elevator company may be subjected.

OTHER METHODS OF SHIPPING GRAIN

Grain may be shipped by other means than through the country elevator. I shall read a section of the Act regarding "loading platforms":

Section 60. The Board may, between the 15th day of April and the 15th day of October in any year, on the application of ten or more persons who are engaged in the growing of grain and are in occupation of at least one thousand two hundred acres of land, within twenty miles from the railway siding, other than a siding reserved for crossing purposes only, which is nearest to the said lands, require the railway company on whose line such siding is, to construct or enlarge thereat, within thirty days after the receipt

by such company of such notice, a loading platform or an addition to the loading platform, as directed by the Board.

(2) Every such loading platform shall be of such height as may be prescribed by the Board, and of such length, not exceeding one hundred and sixty feet, and of such width, not exceeding twenty-four feet, as the Board may direct.

(3) Any person shall be entitled, without charge, to make use of any loading platform for the purpose of loading grain.

Loading platforms number 2,727, and will accommodate 6,489 cars at one time.

Farmers generally are appreciative of the service to be had at country elevators, as 95% of all grain is shipped through them, only 5% going over loading platforms.

The Board of Grain Commissioners annually fix the maximum tariff for the handling and storage of all grain in country elevators.

The charges in effect at country elevators at the present time, however, are not the maximum tariffs, but are as follows:

For receiving and shipping wheat, $1\frac{3}{4}$ c per bushel; oats, $1\frac{1}{4}$ c per bushel; flax, 3c.

For storage after the first fifteen days, for which period no storage is charged, $1/45$ of 1c per bushel per day on all grains.

TAXES AND SALARIES LARGE

Country elevators pay large sums in municipal taxes. From a survey which I have made with the help of a number of elevator companies, it would appear that the average tax per elevator over the three provinces amounts to a little in excess of \$130.00 per annum. It has been previously stated that there are 5,718 country elevators which pay, therefore, approximately three-quarters of a million dollars in municipal taxes annually. Alberta elevators pay in addition \$50.00 per elevator, which I presume is a tax in lieu of business tax.

Country elevators pay in salaries to agents in excess of six and a quarter million dollars annually.

A TWO-FOLD SERVICE

Country elevators perform a two-fold service in warehousing and merchandising Canada's grain. They are required by law to perform warehousing service within the strict limitation of the Canada Grain Act, which regulates the method of handling and the maximum charges. As merchants, they are at all times pre-

pared to buy outright the farmers' grain, or advance monies against the security of grain stored with them. Mr. H. L. Griffin, addressing the World's Grain Exhibition and Conference in Regina, said: "This constant buying of grain, the holding of grain not immediately required, and the maintenance of a continuous cash market, are to be regarded as the most important aspects of the merchandising functions of an elevator system". This, of course, requires extensive banking arrangements.

A THREE-FOLD SECURITY

The bank very properly requires a three-fold security against grain loans to elevator companies. **First**, the hypothecation of the grain. **Second**, hypothecation of property and other assets. **Third**, an assurance that the elevator company has resold for future delivery the grain which it has bought from the farmer. The resale of cash grain purchases is called a hedge, and statements are required by the banks to show that the grain is hedged. This limits the risk involved in the lending of money, and limits, also, the risk of loss by the elevator company; it has been termed "price insurance". The fact that there is a futures market which limits risk, is of distinct benefit to the farmer in the price which he receives.

Country elevators form the first link in the chain of warehousing and transporting facilities required to move Canada's grain from the primary market to the consuming market. The next link is the terminal elevator, which receives the shipments from the country elevator, and the one works with the other, efficiently performing a necessary public service at a minimum cost.

The foregoing has been a technical description of how the country elevator functions under Government supervision and regulation. There are, however, other features about the operation of country elevators that are most valuable to farmers and are quite apart from the duties imposed as licensed warehousemen.

AN ENVIABLE RECORD

Any country elevator will accept grain from any farmer, any working day, at any hour and in any quantity, and will pay spot cash for that grain. I think it is safe to say that hardly any other worker in any other industry, with the possible exception of the gold miner, has been able to sell, wherever he wishes, for cash, the product of his labor. I do not know of a single instance of an elevator company having issued a cheque in payment for grain

that was not as good as gold. This is, I believe, a very enviable record.

Country elevator companies, through their broadcasts of information regarding crops in this and other countries, and the quoted prices here and in other lands, bring the grain market right to the farmer's door.

As you know, our crop is harvested and threshed within a short period, and railways could not, with their present equipment, handle it all at once, and terminals could not do so. Even if they could, the importing markets require a year, and sometimes longer, to absorb our production. The country elevator performs this national service of storing the grain from our prairies until demand moves it forward.

QUESTIONS AND ANSWERS

Question—I would like to ask a question. You may not have the figures handy. I would suggest that if you have not, you put them in your manuscript for printing. In the first place, I think you said there were something like 5,718 elevators in existence. Could you tell us how those are divided amongst the so-called trade, United Grain Growers and the Pools?

Answer—I could give you only approximately the figures from memory, but will show them in the printed copy of this address. After checking up the records, we find that the Provincial Pools have 1,651 elevators; the United Grain Growers have 437 elevators; the balance of 3,630 elevators are represented by line and private elevator companies.

Question—You mentioned there was a differential in the price paid for carload lots and less than carload lots, and you said the reason there was such a differential was because of the increased risk to the elevator company in the reception of small lots of varying grades. Would you please elaborate on what those risks consist of?

Answer—There is the case of carrying grain until shipping quantities are available of the grade that has been delivered. Suppose a farmer delivers a small quantity of smutty 2 Northern, and that is the only smutty 2 Northern in the house. One would very likely be obliged to carry that smutty 2 Northern for a considerable length of time until a sufficient quantity of that particular grade was available for shipment.

Question—You have to hold it for a lengthy period, until you can get railway transportation for that particular grade?

Answer—Yes, and if it is not shipped, there is a risk also of it going out of condition, particularly certain grades; or extra expense of bulkheading the shipment with other grades or grain.

Question—In connection with the bonding of elevator agents, why are they bonded?

Answer—They are bonded more for the protection of the elevator company than any other reason, the same as in any other organization. As I have already mentioned, the companies themselves are bonded for the protection of the producer.

Question—How is he checked up regarding weights?

Answer—He is checked up by the weights that must be reported to the Board of Grain Commissioners each year, showing total receipts and shipments from the elevator. Also, by the records kept in head office, together with the weigh-up of the elevator stocks annually, or sometimes oftener by his traveller.

Question—Bonding also protects the farmer, does it not?

Answer—I would not look on it primarily as a great protection to the farmer. It is a fact, however, that the caliber of the man one must have as an elevator agent requires one who can obtain a bond, resulting, of course, in obtaining a higher standard of agents.

Question—Isn't it true that the elevator companies are bonded by the Board of Grain Commissioners to protect the farmers?

Answer—I have already said so. There is a provision in the Act requiring that each licensee shall provide a bond to the satisfaction of the Board to ensure payment of all sums due by him under contracts which he has made.

Question—You consider, do you not, the elevator situation is overbuilt? Could you give any indication as to the percentage of overbuilding there is existing at the present time?

Answer—It is a difficult question to answer as to the percentage of overbuilding of country elevators, and will depend largely, I think, on the policy of carry-overs in this country. Perhaps we are not too much overbuilt with country elevators if we are going to carry three hundred million bushels of wheat here, but I hope for the good of Western Canada that that situation will not exist. If it does not exist, we are overbuilt because on account of the number of country elevators which we have (and those of

us in the business know) it is difficult to get a handling in our country elevator over our entire line which makes it a profitable business to be engaged in.

Question—Was there any particular condition which led to the overbuilding?

Answer—You remember that I said, when discussing the increase in the number of country elevators in the period 1925-26 and 1930-31, that it was during that period that the Provincial Pools constructed so many elevators. I do not think it would be wise in a talk of this nature to enter into a discussion whether they were right or not in doing what they did. It is a fact, however, that their building did aggravate the situation and today we have too many country elevators.

Question—Don't you think the number in the long run might not be quite so serious an affair for the regular grain trade as may appear, because through this new elevator building on the part of farmers themselves they naturally come more in contact with the working of the grain trade and become more familiar with it, and they have had their fling with the Pool method and they are returning to the tried method of the line companies, and there will become a more general understanding of the grain trade and less animosity to the Grain Exchange? Might there not be that to be gained?

Answer—Perhaps that is true.

Question—Is there a record available of how many line elevators were wrecked or moved since the Provincial Pools started to build here, there and everywhere?

Answer—This information might be obtained from each individual company, but the total figures are not readily available.

Question—There are certain expressions used from time to time that one hears. One of them is "pay over the list". Now, some of us apparently would like to know what this "list" is, and what is the relation between this list price and the price actually paid?

Answer—The list price is simply the price which the elevator companies send to their agents each day, instructing them as to the price of various grades of grain, and it is based on the futures price at the close of the market. If there is a change in the futures price, it goes out by broadcast during the market session.

Question—Are these list prices known as “street prices”?

Answer—That is correct.

Question—How are these street prices set, and who decides the price?

Answer—The prices are decided by a committee representing elevator operators.

Question—Would it not be true to say that the street list price is the minimum price that a buyer can pay? There is nothing to prevent him paying more if he sees fit?

Answer—That is correct, and that answers, perhaps, the question which you asked in connection with the expression “pay over list”. It does occur where competition is keen on a market, and an agent does not think he is getting his fair share, that he will pay over the list to try to attract business.

Question—When you answered Mr. Jones about list price, and said these prices were set by a committee of elevator operators, is it not a fact that they are fixed, first of all, by a special committee, to which the Pool has a membership, and which the Pool occasionally attends? Secondly, that the prices so fixed are a fair reflection of the market prices? Thirdly, that the street prices so fixed only have reference to less than carload lots?

Answer—Yes, that is all correct.

Question—What has happened to all the commission agents?

Answer—They are still in existence, as far as I know. I think it has resolved itself to this in the handling of grain: I have told you that 95% is put through country elevators and 5% over the platform. I think about the same percentage goes through country elevators compared to that handled by the commission houses.

Question—How is it possible for elevator agents to consistently overgrade grain, in view of certain regulations of the Board of Grain Commissioners, that the grain must be bought according to grade only?

Answer—Well, if elevator agents did consistently overgrade grain, there would be no lecture tonight, as no elevator companies could stay in the business.

Question—Due to improved roads, Western Canada has witnessed the advent of the commercial trucker. These men pay the farmer almost the same price for his grain at the farm as he will

receive from the country elevator agent. Haulage costs having thus been saved, what inducements are there for the farmer to haul to the elevator, as the truckers load over the platform? Does their increase constitute a threat to the invested capital represented by country elevators? In other words, could the time come when elevators would be non-existent?

Answer—I have tried to show you that our country elevator performs a much wider service than simply the handling of the grain. Take, for instance, the matter of inspection. When a farmer markets grain through a country elevator, it looks after the inspection of that grain, has a reinspection, if necessary; freight is also paid by the country elevator. The thing has not yet become a menace, and I cannot see that it ever will, on account of the many advantages the country elevator offers, as indicated by the very large percentage of the handling which goes through them.

Question—May I add a little to that trucking of grain. In the United States it has become a very big thing, and it is confined entirely, or almost entirely, to the movement of grain that is consumed on other farms; in other words, consumed entirely at home. In the United States there is probably 150,000,000 bushels of corn that is moved from one farm to another, and that is where the trucker does a great deal of his work. All grain that moves to terminal markets or manufacturing industries is not handled by the trucker at all. There is no economic advantage for him in that; it is only where he picks up grain on one farm and hauls it to another, maybe one hundred or one hundred and twenty-five miles.

Question—You told us there are over 5,000 country elevators and over 2,500 loading platforms, which means loading platforms are 50%. You told us 95% of the wheat went through country elevators. That must mean that there are a lot of country loading platforms that are not doing much business. That would appear on the surface to indicate that the service given and the prices charged for handling grain at country elevators is at least satisfactory to the farmers, otherwise they would use loading platforms more, unless it is that it is difficult for farmers to obtain cars at country platforms. Could you tell us whether farmers could obtain cars at loading platforms?

Answer—Yes, that is covered in the Grain Act. My recollection is that a country elevator may have two car orders unfilled

in the car order book, and while a farmer may have only one unfilled order, there may be a very large number of farmers who have orders on the car order book for cars which are unfilled.

Question—Has there been any effort by the line companies to acquaint farmers of the financial way in which the grain is handled? In four week-end trips I have taken among people who are growing grain near Lake Winnipeg, fifteen or twenty came up to me and told me how wealthy these line elevator companies must be to buy every load of grain offered; they must have millions of dollars. They seem to have no idea of the hedging market and how grain is bought and paid for.

Answer—Work is being done by elevator companies in that respect. Elevator companies are always trying to acquaint the farmers with the methods which are available for handling grain.

Question—You referred to some elevators being equipped with cleaning machinery. What is the nature of the service offered by this grain cleaning machinery?

Answer—The service is that of cleaning. I do not quite understand the force of your question.

Question—Could a farmer bring in grain and have it cleaned and then take his screenings back home?

Answer—Yes, he could; and that is done.

Question—Is cleaning done free of charge?

Answer—It is on street grain, but not on carload lots.

Question—Why is it that Alberta elevators are not equipped with cleaners?

Answer—There are some cleaners in Alberta, but not many, for two reasons: First, the grain in that province at the present time does not contain as excessive dockage as the grain in Saskatchewan and Manitoba. Second, when it is worked out in dollars and cents, in a great many cases I do not think it is as great an advantage to the farmer to have his grain cleaned and his screenings taken back. The installation of cleaners involves a great expense, and it is not yet apparent that it is necessary in Alberta.

Question—Is platform loading on the increase or decrease?

Answer—I cannot answer that question. It certainly has not increased much when one considers that the handling over the platform is only 5% today, and that there has always been some platform loading.

Financing the Western Grain Crop

Mr. Chairman and Gentlemen:

The business of banking, which one might say has become the organization of credit and monetary security, is very old. For a long time it has been a very important part of the blood-stream of civilization. Its origins are traceable in the last thousand years B.C., when social security and private property developed, as there began to emerge from the multitude of serfs, slaves, officials and the masses of common laborers, individuals who had obtained a status or condition of freedom.

While the banking family tree is very old it must concede an older tree to the grain trade. Grain was bartered for goods or sold for coin in the countries adjacent to the Aegean Sea before any Banker hung out his sign in Babylon.

More particularly for the information of the junior members of the Club I should like to give a definition, or a description, of a Bank, and to do so would like to quote from a recent address by Mr. Robert V. Fleming, president of the American Bankers Association:

"A group of men, stockholders, put up their money, which is capital. They set up a place of business and accept your money, deposits, and agree to give it back when you demand it. Your money and theirs is loaned to those who you think could repay. The bank loans not to those who have a brilliant idea and nothing more, who need capital to start a business, because that would be going into partnership using depositor's money for speculative purposes. It loans not to those who have no demonstrated capacity for business management. It does not loan on get-rich-quick ideas or to those who would be merely throwing good money after bad in a sinking venture. A bank is as necessary to a community as a retailer, or a railroad, or a manufacturer. It provides a service--to depositor and to customer--a service necessary to sustain the great volume of business activity carried on in this complex business world. Economists tell me that nine out of ten of the millions of business transactions carried on daily in the United States are done on credit--only one on cash. This is an age of credit. Credit is simply confidence, one man in another, that he will keep his word, and, what is important just now, that conditions are such that he will be able to keep his word. A bank

is the highest development of this credit and confidence in the community. It accepts your money; pledges itself to return it on demand. It supplies the stream of credit needed for the community's many business activities. It assumes the risk of its judgment in deciding to whom and how it lends **your** money. If it makes a mistake, its stockholders and directors pay—sometimes double their investment. Without banking facilities we would return to the days when wampum and tobacco were tokens of exchange and when, as a result, there was little credit and little business."

* * * * *

Your chairman on one occasion said that the object of the Grain Men's Lecture Club was to follow grain from the producer to the consumer.

The largest financial operations in crop moving, as in other branches of commerce, are now more a matter of credit than bank notes. The financing of the crop movement begins largely with the elevator operators and track buyers rather than with the farmers. Of course a farmer may load and ship his own car of grain from the loading platform independent of any elevator.

As a rule, the first movement of crop is from the farm to a local elevator. The farmer wants cash. His grain will not reach the consumer for weeks and months.

* * * * *

In connection with the cashing of grain tickets and orders issued by country buyers, the line elevator companies file with the banks a grain schedule letter. This form, when completed, is filed with the Bank's Winnipeg Superintendent or Supervisor's Department.

Banks undertake to provide payment for all grain tickets presented and for other cash requirements, as you can understand it is most important that every grain ticket be honored upon presentation. The letter provides an agreement covering many matters, such as:

Charges for cashing buyers' orders and grain tickets, for making up statements, for mailing cash parcels with insurance, etc.

Provision for the encashment of grain tickets presented at banks other than the bankers of the company.

All bank drafts, with tickets attached, must be presented at the office of the grain company before 11:00 o'clock on Saturdays and 12:00 o'clock noon on other days, if they are to be paid on the same day.

Responsibility for errors or alterations in figures or calculations, etc.

The matter of forged signatures of drawers or endorsers.

Instructions regarding the increase in any daily credit, if the arranged amount proves insufficient on any day.

Guarantee from the company's bankers to other bankers who may be asked to cash tickets.

Particulars regarding the branch of the bank affected, station, the buyer, the payor, and the daily limit.

All of this has a direct bearing upon the important matter of seeing to it that the producer, that is, the farmer, can get the cash immediately for his grain, whenever he wishes to sell it.

The magnitude of seasonal variations in credit requirements was stressed at the sittings of the McMillan Commission. There have been years when the value of our Western grain crops exceeded one half billion dollars. There have been days when one of our Transcontinental systems has loaded $3\frac{1}{2}$ million bushels into 2,430 cars between dawn and dark. Ninety percent of world wheat is grown in the Northern Hemisphere and harvested in four months. The Canadian crop of wheat is harvested in two months. We always hope to have our large exportable surplus sold in the succeeding twelve months, and in this period of collecting and placing in best positions for sale, and finally selling, this huge national business has to be financed. This is where the Banks must assist, where security and risk factors require the close attention of Bankers.

The average Western crop requires a floating loan of roughly \$100,000,000.

Additional bank notes have been issued in the past, up to the extent of \$20,000,000 under the special requirements of the Bank Act. Excess currency requirements are now taken care of by the Bank of Canada. The chartered Banks must reduce their outstanding notes 5% per annum for five years, commencing this year, and then 10% per annum for another five years, so that by 1946 they will have the right of issue of their own notes up to only 25% of their unimpaired paid-up capital.

In the June booklet of the Canadian Society of Technical Agriculturists there is the following information in an article by Mr. J. R. Murray on "Transportation and Handling of Grain":

There were 223 elevators and flat warehouses in 1890, with a capacity of 3,758,000 bushels.

In 1935 this number had increased to 5,725 with a capacity of 190,700,750 bushels.

Apart from public and private country elevators there are in Canada 143 houses, terminal elevators mostly, with a capacity of approximately 230,000,000 bushels.

95% of grain shipped from country points is handled by country elevators, the balance passing over loading platforms.

In 1928-29 there was the largest movement of grain—548,644,917 bushels.

Freight and handling charges between producer and British ports (C.I.F.) is 31.5c per bushel.

* * * * *

We have good western farm lands that can produce, given a larger population and improved farming methods and ideas, crops greatly exceeding in volume the production of previous years. It may sound strange in the light of events, arguments and legislation in many countries in recent years, but I think that while certain areas may come to be specialized in the growing of certain kinds of grain crops, or in raising livestock, there are vast areas suitable for diversified farming operations that must in time support a much larger, very much larger, population. By intelligent methods they (our Western farmers), will be able to stand on their own feet during unfavorable crop years and be ready in other years, or cycles of years, to supply huge quantities of our good wheat to a world steadily increasing in population and improving its standard of living. I think it can be argued that Canada has, in its grain handling equipment, a preferred position that must improve our trading position in time.

In all of which Canadian Bankers, with their Branch Bank System, are vitally interested.

THE CROP MOVEMENT

As was pointed out by Mr. Sanford Evans in a previous address given to the Club, the liquid capital of all the grain and terminal companies and other dealers directly interested in the financing of the grain trade, would not begin to meet the cash requirements in the handling of any crop.

The stages in the movement are, briefly:

1. The payment to the farmer at a country point, which is made by a loan to the local elevator company by a bank.
2. The payment of freight to Fort William or Port Arthur or to Vancouver, which adds to the value of the grain, through its progressive position, which is also taken care of by a bank loan.

3. The terminals at lake head or at the Pacific Coast, in their storage facilities, rely on the banks for financing against their warehouse receipts.

4. Great Lake shipments may be a matter of additional freight charges added to the value, or may involve the sale to an Eastern interest. In this latter case the grain bill of lading, with insurance papers, is a document which is usually the basis of security behind a bill of exchange sold to the bank, or carries title until exchanged for an Eastern terminal warehouse receipt.

5. Similar transactions may be involved at Eastern bay ports and lake ports, with the grain usually arriving for temporary Canadian storage at such ports as Toronto, Montreal, Sorel or Quebec. Buffalo also enters into the picture here, due to its strategic position for quick shipment to tramp steamers and liners leaving U.S. Atlantic ports.

6. The ocean bill of lading from an Atlantic port, or from a Pacific port, is usually the final Canadian contact, the ocean bill of lading and other papers providing the final security behind a bill of exchange on Liverpool or some other British or Continental port.

Loans are also required at times to pay the Clearing House on your hedge sales when the market goes up. But I have not considered this as a part of the actual crop movement.

In this you will see that through documents provided by those storing wheat or issuing bills of lading as common carriers, a complete chain of documents is available, which in the great majority of cases are always in the hands of bankers or in their custody through bailee receipts, and which are the collateral behind those original payments to the farmers, which collateral, of course, increases progressively in value as the grain arrives nearer to the foreign importer.

In speaking of the liquid or working capital of the grain trade as being inadequate to attempt to finance the movement of the crop, I should like to say a word regarding liquidity, which occurs more in a banker's vocabulary than that of a grain merchant.

To give a simple illustration: if 20 of you each give me 5c to look after, thus appointing me your banker, I have \$1.00 in my pocket and am 100% liquid. In this position I cannot make any money as a banker. If I lend 40c then I am 60% liquid. If I lend 60c I make a better use of the capital you have entrusted me with—I have a larger profit—but am only 40% liquid. This percentage of liquidity may be a quite safe figure, depending

largely on the nature of my business relations with my customers. If I lend 90c I am about up to a maximum in profits, but a sudden call from three depositors would find me unable to pay. It is fundamental in the banking business that a banker's position be at all times safely liquid.

Every grain merchant must keep his financial position liquid, while at times contracting quick liabilities many times the amount of his liquid working capital, which is somewhat of an anomaly. His yearly line of credit from his banker arranged in advance, to be drawn on and interest paid, only as required, gives a grain merchant this leeway, this ability to trade, this power to give service to his many customers. Without it he would be like a sailing ship without sails, with the trade winds blowing freely.

Liquidity applies to grain stocks in this sense that in the system of grain handling built up over many years, stocks in acceptable positions can be quickly realized on, that is, sold for cash without delay. Obviously any condition or trading policy that interferes with the daily free trading in a world commodity like wheat must create difficulties for both merchant and banker, to the ultimate disadvantage of the producer of the grain.

If I may carry the illustration previously given a bit further, supposing I am a schoolboy, start a miniature bank, and have \$1.00 in deposits entrusted to me. We will say young Jones asks me for a loan of 5c. I lend him 5c in cash and charge him interest. But Jones may tell me he is afraid of losing the 5c I lent him, which would be a blow to him and might cause some unpleasanliness with his parents. He may ask me to open up a ledger account and give him a credit of 5c. He will go to the confectionery store on the corner and give the confectioner, say, five orders for 1c each in two or three days, and when the confectioner presents these orders to me I will pay him 5c in cash. But some of our critics see in this ledger entry something almost fraudulent. They say: "By that ledger entry, with a mere stroke of the pen, you have created credit out of thin air, and worse still have had the effrontery to charge for the creation."

Banks do not create money or credit. Ordinary productive business produces its own collateral. If we had a spurt of industrial activity next week here in Winnipeg, the new products, either made or in the making, would automatically be daily providing new goods, new wealth, new collateral, as a basis for any banking loans required to pay for things incidental to production and bridge the gap between the time of production and the time of sale and payment.

The producer creates the new wealth. The banker is a bridger, not a creator of credit. The Banks in Canada have paid up capital amounting to $145\frac{1}{2}$ millions and reserve profits of $132\frac{3}{4}$ millions of dollars. They have demand and savings deposits of approximately 2,000 million dollars. There are over 4 million savings accounts in chartered banks in Canada. For every \$100 we loan you, approximately \$8 is from our own paid-up capital and reserves, and the balance is taken from the deposits of other people, for whom, in a very real sense, we act as agents. We pay depositors what we can for the use of their money and, after meeting all expenses, try to find some small margin in the rates we charge you, from which to make some dividend return to our shareholders.

CREDIT—LOANS

While our chief interest in the grain trade is largely in the matter of loans, there are of course other transactions which may not be directly connected up with loans, but usually have some bearing on credit. The fundamental basis of credit is confidence—mutual confidence.

The minute you require to lean on a banker for credit and for loans, it is surely fundamental to a proper working arrangement between any dealer and his banker that the security he creates in his business, with the assistance of the loan, should be available to the banker as collateral, without hesitation, if required.

If you are loaning money to a wholesale merchant, usually his need for money from the bank is because he has not received payment for goods shipped to customers. When these accounts owing by customers are paid, he can pay the bank off. In the meantime, surely such accounts are labelled in his mind as tied up to his bank loans. In giving an actual assignment to the bank, he is only completing a logical chain of business procedure.

In the case of the manufacturer, he usually requires banking credit to pay for labor and material to produce certain machines or commodities. Until his goods are sold, they have wrapped up in them the bank money.

In the case of a line elevator company, or a terminal elevator company, the grain, or a large part of it, which is represented by their country stocks or terminal warehouse stocks, has been paid for by bank loans, and the bank loans are tied up in these stocks. Therefore, the giving to the bank of security on the country stocks or on their terminal stocks is a perfectly logical and normal part of the business.

In the grain business particularly, the desire of your bank is naturally to hold actual realizable and self-liquidating security, but at no time, by such holding, to hamper the quickest possible transfer and movement of the security and all related documents.

Usually when we start to finance the movement of the Western grain crop, our security is under Section 88 of the Bank Act, about which I shall say something later. While, in this security, the grain you have purchased is hypothecated to the bank, it is yours to move and deal in freely. At certain stated periods we require statements, certified by your auditors, showing the amount of grain held, which has been hypothecated to the bank, and your position with the Clearing House, i.e., the forward sales you have made to protect your purchases.

In other lines of business than grain, ordinarily you cannot issue a warehouse receipt out of your own warehouse on your own property. The idea in a warehouse receipt is that an independent party, in the business of storing goods, gives, in his receipt, a transferable document which, with certain protective documents such as fire insurance policies, is a negotiable document which can be used as security, depending upon the class of goods warehoused, their marketability, the ease with which they may be shipped and other features. But special provisions apply to grain.

When you own grain in your country elevator you cannot give your own warehouse receipt or elevator receipt to your banker, but when you move grain from your country elevator the railway bill of lading is actually a warehouse receipt, a moving warehouse receipt. I am speaking of the order bill of lading, of course. These bills of lading are turned in to us as security.

The railway bill of lading is, of course, only a temporary receipt. Grain is usually unloaded from railway cars into terminal elevators. All terminal elevators in the Western Division are under the supervision of the Board of Grain Commissioners. Terminal warehouse receipts are endorsed by the Board of Grain Commissioners. The grade and quantity is set out. The grain is automatically insured, in the tariff charges, against fire. The date to which storage has been paid is indicated. If you are a terminal elevator company, your own terminal warehouse receipts are just as acceptable to your bankers as if such were issued by any independent company in that business. In this respect they are a special class warehouse receipt.

Your terminal warehouse receipt is a document on which you can realize in the market at any time during any session.

Lake Shippers transfers are recognized by the grain trade and the banks as having the same qualities as a terminal warehouse receipt, as every transfer has a warehouse receipt back of it.

Your lake bill of lading is another warehouse receipt of the same type as a railway bill of lading. When the boat is loaded, the owners of the boat in their marine bill of lading give what is in effect a warehouse receipt. This document, when accompanied by invoices and marine insurance, carries title to the cargo.

Ocean bills of lading are in the same category as lake bills of lading.

All of these documents, in the title that passes with them and the actual realizable values available in the world demand for grain, constitute acceptable banking documentary security.

In the transferring of such documents into and out of banks, another document is in constant use. This is a bailee receipt, which may be called a trust receipt. You will find the wording in most bank bailee receipts largely conforms to the following:

"We undertake to sell the property therein specified for account of the said bank and collect the proceeds of the sale and deposit same immediately—in the bank—for the credit of our account—hereby acknowledging ourselves to be the trustees of the said property for the said bank."

The following is, therefore, the ordinary chain of security held by the banks in financing the grain crop:

1. Section 88 security on grain in country elevators, with fire insurance, about which I shall have something more to say in a moment.
2. Railway bills of lading covering such grain movement to terminal points.
3. Warehouse receipts for grain in storage in terminals.
4. Lake bills of lading with insurance papers, invoices, etc., covering grain in lake boats moving East.
5. Warehouse receipts again cover the grain in such places as Montreal where your receipts would be from the Montreal Harbour Commissioners.
6. Ocean bills of lading, insurance invoices and other necessary documents, at Atlantic and Pacific ports.

SECTION 88

In speaking of Section 88 security, one might say that this Act has been praised by many, damned by a few shippers to Canada from other countries, and periodically railed at by every

young banker when first studying its procedure and its legal technicalities. The Act provides that as you produce certain stated classes of commodities and, as you desire to obtain loans from a bank to assist in these worthy ventures, by a simple process you may give the bank security by a prior claim on such goods which will justify the advance.

If something goes wrong, and the banker has to realize on his security, he is often technically and legally right. But he is usually in difficulties in securing physical possession and finding markets for the seized goods. Consequently, although he takes security, he hopes he will not have to enforce it.

The law says the bank may have or may obtain this preferred security if it follows the procedure set down.

When the bank loans money under Section 88 security, roughly an assignment or lien on goods, not in its own possession, the fundamental or underlying condition is confidence in the honesty and ability of the borrower.

In all loans under Section 88, naturally we assume goods are being bought or produced against orders to sell at profitable margins, or in reasonable anticipation of such orders. We would not be given credit for much shrewdness if we were content to loan money to be tied up in goods for which the future demand was problematical.

The actual security on grain under this section of the Bank Act is called an hypothecation. The definition of hypothecation is a pledge or mortgage. The forms in use by all banks are standardized and are:

(1) Schedule G—being a notice of your intention to give Section 88 security. This is registered at the office of the Receiver General in your province.

(2) A separate agreement between the bank and the customer, setting out the rights and powers of the bank and covering all contingencies.

(3) A separate application for credit from the customer, in which he states the period of time required, the nature of his business, the amount and a general indication of the class of goods that will be hypothecated and their location. This form also embodies a "Promise" to give security.

(4) Schedule C, which is the actual hypothecation form, describing notes given to the Bank, when payable, and amount, as well as estimated quantities, location and description of goods.

The Agreement and application, with the promise, are taken when a line of credit is applied for. They are in force during the term stated in the application. Notes and hypothecation forms are given as loans are made and new schedules of goods are available.

In addition to the above, the borrower has to attend promptly to the submission of statements showing his hedge position and whatever other periodical informative statements may be arranged for.

SECTION 86

Grain loans not under Section 88 are chiefly made under Section 86 of the Bank Act. This section reads that the bank may acquire and hold any warehouse receipt or bill of lading as collateral security for the payment of any debt incurred in its favour, or as security for any liability incurred by it for any person, in the course of its banking business.

Any warehouse receipt or bill of lading so acquired shall vest in the bank from the date of the acquisition thereof:

(a) all the right and title to such warehouse receipt or bill of lading and to the goods, wares and merchandise covered thereby of the previous holder or owner thereof; or

(b) all the right and title to the goods, wares and merchandise mentioned therein of the person from whom such goods, wares and merchandise were received or acquired by the bank, if the warehouse receipt or bill of lading is made directly in favour of the bank instead of to the previous holder or owner of such goods, wares and merchandise.

In a further section, Section 90, it is set out that the bank shall **not** acquire or hold any warehouse receipt or bill of lading, or any security as aforesaid, to secure the payment of any bill or debt, **unless** such bill or debt is negotiated or contracted:

(a) at the time of the acquisition thereof by the bank

(b) upon the written promise or agreement that a warehouse receipt or bill of lading or security as aforesaid, would be given to the bank.

Provided that such bill, note, etc., may be renewed, etc., without affecting any security so acquired or held.

The Act further provides for the exchange and substitution of warehouse receipts for bills of lading, and vice versa.

When you borrow from the bank against security of warehouse receipts, your endorsement, if they are made out in your name, gives us sufficient title. We note the kind of grain and

the grade, the position as regards storage due, and the market price. All terminals in the Western Division are under the supervision of the Board of Grain Commissioners. That Board countersigns all terminal warehouse receipts, and we know that fire insurance protection is arranged, in accordance with their regulations and do not have to worry about this part of the security.

Terminals in the Eastern Division are not covered by the same regulations as regards fire insurance. In some cases there is a fire insurance charge in the storage tariff, and in other cases the holder of an elevator receipt has to provide his own fire insurance protection. Naturally we expect you never to be without protection against fire loss.

The security form taken by a Bank is an hypothecation form, with a note for the amount to be borrowed. This is all that is required to establish the Bank's rights. The form of "Promise to give Security" is usually taken for the reason that the Bank has often to honor your cheques for purchases before you have your terminal warehouse receipts available. Under Section 90 of the Bank Act we may not acquire your warehouse receipts after we make a loan unless we have a written promise that your warehouse receipts will be given to us.

HEDGING

The Canadian system of grain marketing is a natural evolution of a business which one might say began when oxen hauled the first sleigh load of wheat to Portage la Prairie. A natural evolution, I would say, is a development of any business brought about by the normal progress of the business in its normal growth or even a rapid growth. We regard the futures market in commodities and foreign exchanges as a system naturally evolved, through the gradual increase in world trade.

In the address recently given you by Mr. Sanford Evans, you were shown how in the early days at Chicago a custom of trading sprang up in grain, which was not new, but which had been used chiefly for the sale of goods shipped across the ocean from distant countries. This was the practice of selling "to arrive". The long distances from which grain came to Chicago made the development of "to arrive" sales and forward contracts entirely logical. The hedging of grain started there, as a system of forward contracts. Quotations of these forward contracts appeared in Chicago papers before the Civil War. The Chicago Board of Trade was organized in 1848, after which trading in spot grain and in grain for forward delivery was carried on in

an organized market. The extension of railroads into the Western States and the building of warehouses and grain elevators facilitated the shipment of grain and made Chicago a common and important receiving point. A system of inspection and grading followed. Elevator receipts (warehouse receipts) were issued and when these were passed from hand to hand they carried with them a proper transfer of title.

A future contract has been defined as a contract for the future delivery of some commodity, without reference to specific lots, made under the rules of some commercial body, in a set form, by which the conditions as to the unit of amount, the quality and the time of delivery are stereotyped, and only the determination of the total amount and the price is left open to the contracting parties.

To a Banker, the putting out of a hedge simply insures to you your profit incidental to handling and storing the commodity dealt in. You decline to gamble; you have quite sufficient to keep you fully occupied without stepping into a deliberate bet that you know what is going to happen in the future. If you hedge No. 5 wheat, say when the price is \$1 for No. 1 Northern, you stand the risk of losing on the spread if the price goes to say \$1.50. There are always certain undefined risks in attempting to hedge non-contract grades of any grain, or in paying premiums for certain grades. These are details on which Bankers are obviously not so well informed as grain men, but which we assume you are watching closely every day. We must have confidence in your ability to run your business with the minimum of risk.

If you are a Broker, and are carrying a line from a Toronto, Montreal, Chicago or New York house, we expect you to have a clear cut arrangement regarding the availability of cash margins, and no qualms about protecting yourself should the other party fail in living up to the arrangement.

We lend money in order to make a profit. In our business of lending money, we must make sure that we can and do get it back without trouble, and with some hire paid for the use of the money. If we lend you money to buy wheat or oats, without taking any interest in the manner in which you have protected your position, you might very well come to us at a later date and say: "About those oats—well the price went down instead of up. We are very sorry and hope you will not make us feel any worse by asking us how we are to repay what we have borrowed from you."

The hedges statement of say January 7th, which you gave us on January 12th, is of value to us, as a confirmation of what we assume, i.e. that you are properly hedging your purchases. We must have implicit confidence in the integrity and ability of our borrowing customer; the basis of credit is fundamentally one of confidence. As Mr. Thomas Bradshaw said in a recent address when discussing bond obligations:

"Dare we risk any suspicion of apathy, of negligence or of sharp dealing in the fulfilment of our obligations? Our intelligence advises us, our conscience entreats us and our honour commands us to do unto others as we would have them do unto us."

* * * * *

The sale or purchase of foreign exchange is more common in other businesses than the grain trade, but as it is a system of hedging, a word about it may not be out of place.

Supposing you are a shipper to the United States of pulp or fish or lumber, if you got an order for say \$10,000 worth of goods to be shipped in April, \$20,000 in May and \$50,000 in the following two months, you would have to make your arrangements ahead to gather together and ship the goods in these months. You would be paid, let us say, by a cheque from the buyer, say in St. Louis. Competition is keen, and you have figured on a profit at 7%, that is, for every dollar's worth of goods sold, a profit of 7c.

The trouble is that when the St. Louis buyer sends you his U.S. dollar cheque, U.S. dollars may be worth less than par in this country. Not so long ago the American dollar went down to 90c. In the example quoted, if you ran up against a 90c U.S. dollar in the spring months, you would actually lose 3c on every dollar's worth of goods shipped.

Or you may be closing the above contract with U.S. dollars at a premium of say 5c here, and may have cut your price to get the business on the basis of the premiums you could figure on these U.S. dollar remittances.

So you come to your banker and say: "I am a manufacturer, (or a wholesale dealer in pulp or fish or lumber), but it is not my business to watch the foreign exchange market—I have enough to attend to in my own business. I would like to handle these orders, but I am very much disturbed with the risk I may be taking in view of present world conditions and the fluctuating instabilities of so many foreign currencies." We in turn can say to you—set your mind at rest about fluctuations, as we will contract now to take your U.S. dollar cheques in the months you specify, for the specified amounts, at certain rates of discount or

premium, which might vary from $\frac{1}{2}$ to $\frac{1}{2}$ of 1% for any month depending upon the demand for exchange (U.S.) in the particular month. In a market where daily fluctuations were usually wide, the spread would of necessity be greater. You would know then exactly what your profit was going to be. When these future months arrived, if the exchange rates were in your favor, you would not benefit, but neither would you suffer any loss if they had gone against you. Through your hedge you have taken out profit insurance at a trifling cost.

The operation is exactly the same in principle as the hedge you put out in your market here.

In contracting with you to buy your foreign exchange at a certain rate in some future month, or in contracting to sell your remittances on foreign countries at certain rates in future months, we do not take any chances; you would be surprised if we did. We simply find a man who is in the corresponding position in the foreign country concerned. We match his transaction against yours. The fact that daily, hundreds and thousands of such transactions are so matched does not alter the simple governing idea and practice.

FOREIGN EXCHANGE

From the standpoint of the ordinary merchant a gold standard is more the concern of governments and has to do with international payments, and large commitments of international bankers. The local merchant, with some few exceptions, is not seriously aware of any difference in his business if his country is on or off the gold standard. Where he becomes interested, if he is an exporter or importer, is in the supply and demand for exchange in those markets in which he trades. In other words, if there are not enough exports from Montreal to London to counterbalance shipments from London to Montreal, then Montreal importers will find a scarcity of sterling exchange and will start bidding it up, so the Canadian exporter will receive more for his draft on London, and, knowing this, can make allowances in the prices he quotes, f.o.b. Montreal or f.o.b. London.

Conversely, if Montreal exports to London are greater than London shipments, bills on London will be too plentiful, and will be at a discount. He will, therefore, get less for the sterling draft representing the amount of his sales, and will have to bring this into consideration in quoting prices to London importers.

Leaving out interest charges, if your Banker quotes you sterling at the par rate, \$4.86 2/3, and your Liverpool importer

bids the equivalent of \$1.00 per bushel for wheat, then you know you will get \$100 Canadian funds for 100 bushels of wheat, for every \$100 in your bill of exchange on Liverpool or London which you may sell to your Banker.

If the pound is quoted at \$5.00, then on the same Liverpool wheat quotation you will get from your Canadian banker \$102.73 Canadian funds for every \$100 in your bill of exchange. You will thus have an exchange profit of \$2.73 in every \$100. You could cut your offer 1c per bushel and be up \$1.73 on every 100 bushels, or $2\frac{1}{4}$ c a bushel, and forego the exchange premium profit and use it to meet competition from other countries.

If sterling exchange went against Canada very badly, we might quote you \$5.50, or even \$6.00 to the pound, but any such spread would not be helpful in the long run. Putting down the value of your domestic dollar must lead to an increase in domestic costs, and in the long run, any such calculated practice would defeat itself, and any anticipated additional profits would be an illusion, with an aftermath of aggravated conditions for every business, government or private.

Of course foreign trade is not a matter of shipments between two given countries, but is more the resulting balance for or against when shipments to and from all countries have their final effect on the exchanges of any one country in those exchange markets which, from their position and prominence, set relative exchange quotations. If gold is moving freely between any two given countries, the fluctuation in exchange is limited to within the gold points. If you have a debt to pay in New York or London, you would not pay exchange in excess of the cost of shipping the actual gold. This is about $5/32$ of 1% as between Montreal and New York. The yearly grain exports of Canada are a large factor in our international exchange position. The mining industry is also a large factor in maintaining our foreign balances. In 1934, metal exports were over \$167 million, of which 57% was gold.

Canada, Great Britain and the United States are all former gold standard countries. They all have a certain amount of gold on hand. Different economists have different ideas as to how much gold at any given time is a proper backing for the general financial structure of the particular country's government and the business of its citizens. The gold policy of these countries, and of other countries, is undoubtedly a matter of very great interest from a broad international standpoint and with respect to future business activity. In Great Britain the stabilized pound has been

substituted for gold as an essential basis of her monetary system. The stabilized pound is now the actively working currency system.

A country may attract gold for different reasons—a good interest rate, safety, a surplus of exports. It may experience a flow of gold away from its Banks through low interest rates, fears as to safety, a too heavy import balance of trade. In the latter case, the government of a country can forbid the sending out of gold. This arbitrary action carries its own penalties, but emergencies may force it. European countries are still badly off balance, due primarily to huge war debts to the United States and the effect of such debts on international trade since 1918.

In theory, equilibrium is maintained in international exchanges by alterations in exchange rates. Supposing a country's payments get out of balance, through owing more than is owing to it. As previously illustrated, its currency will depreciate, but this will make it easier for it to make payments in goods. Its goods will move out in greater quantities—in theory—and this will continue until an adjustment is arrived at by an exchange rate more in line with what may be called a purchasing power parity.

SERVICES GIVEN BY THE BANKS

It would be far from my intent to infer that Canadian Banks and the services they give are not appreciated by business men, including those in the grain trade. I do think that we possibly have ourselves to blame in not having given the public, in times past, a better idea of our functions, the services we give, and dispelling in some minds, at least, the myth that by creating credit by a mere stroke of the pen, and then by charging for this, it is a continuous picnic figuring up our profits.

Your checking accounts for individuals and firms necessitate expenditures for clerks and stationery. You expect your cancelled cheques with a neatly typed copy of your account at the end of each month. For many individuals this monthly bank statement represents their own personal bookkeeping system maintained at a small monthly operating charge or free, if a reasonable minimum balance is carried in the account. You may write cheques to anyone's order and know the bank will see that the right person gets the money.

Your country elevator operator writes out a grain ticket, and hands it to a farmer. It next appears conveniently listed at your accountant's wicket at your Winnipeg office. If you wish to send currency to any agent or customer, a slip to the bank and it is on its way mailed and insured.

At hundreds of points you ask us to establish credits to take

care of grain tickets that may be presented. The local bank manager has to watch and see that in a heavy shipping season he has enough cash on hand, and in a light crop year not too much. He must try to never fail in rendering every service. Large cash holdings increase the danger of loss through bank robberies. These credits in a year amount to millions of dollars—actually we must commit ourselves to be ready for a high volume of payments on your account, but for these country credits we make no charge.

We are prepared to make wire and cable transfers at a cost made extremely low by giving you the benefit of our branch system.

If you will look back and see what rates you were charged for loans, say during the last 20 years, and then compare rates with those charged by bankers in the United States, you will find that never, even when New York rates reached over 20% for call loan money, was there even the suggestion that we should sharply increase rates. It has been ever the aim of Canadian bankers to make every possible contribution to steadiness and stability in business relations.

I have elsewhere referred to banking loans under Sections 88 and 86, without which very few, if any, of you could attempt to operate your line and terminal elevators. You pay interest on daily borrowings, not on the credit you ask for. If say on December 1st you desired a credit of \$500,000, and we took your note for six months and discounted it, this would cost you \$15,000, at say 6%. You can obtain, and do obtain, the right to borrow any day up to \$500,000 from us for six months, or a year, but pay interest only on the total owing each day. You can and do cut your interest charges by this concession to whatever you like, depending on the volume of business offering to you.

There are many services gladly given which never appear in any record but are all in the day's work. Supposing you make a shipment of grain to a Canadian or foreign port on the usual D.O.P. (documents on payment) basis. You give us the regular standing orders to surrender documents attached on payment only. The goods, bill of exchange with documents attached, arrive at the port. When the bank's agent presents the bill and the documents for payment, the drawees of the bill, that is, the purchasers, may say to the bank's agent that they are quite prepared to pay the draft but that they first must examine the documents to see that they are in order and give proper title. There may be a very lengthy detailed invoice, with a lot of shipping documents. Now the instructions to the banker are that he must get

payment before allowing the documents to go out of his possession. If the banker at the port begins to cable back for special instructions, he is putting the shipper to some expense. He might hesitate to even recommend that the purchasers of the grain be allowed to take out the documents on a trust receipt. Some foreign countries have peculiar laws governing bailee or trust receipts. He might send a messenger and a senior clerk to stand guard while the documents are being checked over. You will find that he usually gives an important matter like this his personal attention. Perhaps something unusual has turned up which would be difficult to explain, so he uses his own judgment and perhaps takes some little risk. In the long run, he gets the matter cleaned up quickly, payment is made and the matter is closed. Things like this occur every day without the worried banker at the other end even sending in any report as to what he had to do, according to his ideas of giving service.

May I say that you should not lose sight of all these services and arrangements for your convenience and the saving of your time and money, when considering bank charges.

* * * * *

In its wider significance, the organization of the Canadian grain trade, particularly wheat, must rank high when considering this world as the habitation of man and assuming man is ever struggling for progress, peace and a greater use of all things that make for happiness and a full life.

A man from Mars, were he able to take in as a whole, the various activities in which men and nations are engaged, would, we think, spend some time in studying Canada's system of handling grain and we think would give it a high standing in the arts that improve civilization. Here, he would say, is a really intelligent system—Farm producer—Elevator—Railway—Lake Shippers' Clearance Association—Terminals—Lake Boats—Canals—Eastern Terminals.

In closing, may I say that I felt greatly honored when your President, Mr. Brockington, asked me to give a talk to the Grain Men's Lecture Club along banking lines, although I was very nervous about appearing on a platform to which I knew would be called such excellent speakers as we have had. The addresses it has been my privilege to listen to as a member of the Grain Men's Lecture Club, have been not only entertaining but informative and, I am sure, highly valuable to members of the Club. I hope that in some small way the material I have presented to you as a Banker may contribute something also to the aims and objects of your Club.

QUESTIONS AND ANSWERS

Question—While you mention the question of hedging, would you be prepared to say that the banks require a future contract against a future sale in the pit here insofar as the loan is concerned?

Answer—We do not lend money for speculative purposes. If the security you offer the Bank is grain, we expect you to protect yourself by putting out a hedge, and it would be correct to say that we require it. What is involved in your question is the function of forward contracts.

Question—You require a statement from each company purchasing or trading in grain that they have a future sale made against a purchase or a future purchase against a sale?

Answer—If our security lies in grain, yes, we want to be sure of our position. If you have other acceptable security, then your Banker may feel he does not have to trouble you about giving him hedge statements; but even so he would be surprised to discover you were trying to guess the future and risking money on it.

Question—Under Section 88 we presume a terminal has three million bushels of contract grades and they borrow from the bank an equivalent in credits to cover the value of three million bushels. Supposing they were bullish on the market and removed hedges to the extent of 500,000 bushels. They were long on the market. You have stated you believe in their integrity. If a loss was the result of their action in the market where would you stand in that case? You have a certain amount of collateral but a certain portion of it is unhedged. Is there anything there in Section 88 or the bank laws to protect you in that case?

Answer—The loans you refer to would be under Section 86. There is nothing in Section 88 or 86 or any section of the Bank Act that provides for errors in judgment on the part of the banker. A customer borrowing the equivalent of 3,000,000 bushels of grain would be well known to his Banker. All those extending credit, including wholesalers and manufacturers, are, in varying degrees, open to loss if a trusted customer suddenly becomes untrustworthy. In the case you cite, the removal of any considerable short hedge would soon be apparent to any one who had occasion to follow the account closely.

Question—If you discovered on their hedge statement half a million bushels unhedged you might call them up on the telephone?

Answer—I think they would expect it.

Question—Can Mr. Rae tell us who really pays for grain when it is exported? We know the farmer gets his cheque from the line elevator company. When the exporter exports a thousand bushels of wheat to someone over in Germany who has ten thousand marks ready to pay for it, from whom does he collect? What is the final clearing house?

Answer—The importer pays for it, presumably with his own money or money he may borrow from his bankers. The means taken to collect the money for the shipment has been developed over many years and, in banking parlance, is through the Canadian Bank's "Foreign Exchange Department." Collection is made in the quickest possible time to save interest charges as well as to protect the exporter.

In the case of sales to houses, say in Hamburg, the sale might be made based on quotations in German marks. In such cases the exporting company would draw their drafts on Hamburg, attaching thereto the shipping documents and presenting them to their Canadian bankers who would buy the bill from them at their current buying rate for such exchange. The Canadian Bank's agent in Germany, possibly some Bank in Berlin, would send the documents to their Hamburg correspondents for presentation to the drawee who would pay it in German marks and get the shipping bills. The German marks received by the correspondent would be placed to the credit of the Canadian Bank with its Berlin agent, and the Canadian Bank, to get its money, would sell the same amount of German mark exchange to another Bank who had a customer who wanted to purchase a draft on Germany to take up a bill payable in German marks.

If the wheat was sold on a basis of quotations in Canadian funds, the draft might be drawn in Canadian funds and the Canadian Bank would then forward the draft to its agent in Germany who would collect it at their selling rate for sight exchange on Canada and then remit their draft on Montreal, to the Canadian Bank. Or the Canadian Bank might ask that funds be remitted by cable. The draft remitted by the German Bank would, on receipt by the Canadian Bank, be charged by the Canadian Bank drawn on, against the German Bank's balances in Montreal of Canadian funds. These funds which the German

Bank would have in Montreal, and which they would draw against, would be a resulting credit from the purchase by the German Bank of Canadian funds drafts drawn by German exporters to Canada, payment of which they had agreed to accept in Canadian funds.

There is at least one other way in which the German importer might pay for the wheat and we believe that owing to the difficulties in financing foreign trade experienced in Germany now, would likely be insisted upon by Canadian exporters—the German importer would instruct his German bankers to instruct their Montreal correspondent to pay the Canadian exporter a stated amount of Canadian funds against surrender of shipping documents.

Question—I wonder if Mr. Rae could tell us how far the banks are prepared in the fall of the year when elevator agents are besieged with requests from farmers for advances against twine and other means of taking off the crop. How far are the banks prepared to loan money to the farmers so that the elevator agents do not need to become bankers themselves?

Answer—The Banks are at all times prepared to lend money for such constructive purposes as taking off a crop. Lending money is a highly important part of their business. I assume your question covers cases, unfortunately too numerous, where farmers, crippled by a succession of adverse crop years, cannot show their Banker any reasonable basis of security for a loan (very often where similar loans in previous years remain unpaid), but where the elevator agent, in his actual handling of their grain, can find or acquire the equivalent of a lien for the amount of his loan. The Banker cannot lend out depositors' money—your money—on philanthropic or sympathetic grounds. One might also say that debt legislation that takes away the ordinary legal rights of creditors, no matter how well conceived, must make it more difficult for the debtor to obtain credit; perhaps that is intentional. The country bank manager, unless located in a particularly poor territory, in every year is straining to the utmost such intangible security factors as character and ability against heavy liabilities and lack of any real security, in order to find some justification for making loans for harvesting expenses.

Question—I believe I know what is behind the previous question. The country buyer advances money to the farmer because the elevator business is highly competitive and he takes a long

chance and lends one of his customers enough money to take off his crop in the hope he will get the handling of the grain. Now, the banks in the country are not up against the same thing; they have not got the competition in the country. In these small towns with just one branch, the bank manager says: "He has to come to me, I can say yes or no and nobody else will get his business." Could you clear up my views on that?

Answer—The judgment of bank managers can be at fault like the decisions of other business men, and there may be some who are content to sit back, take no interest in the community and decline to lend money because there is no bank competition. But I have never met any. The qualifications that have promoted him to the bank manager's office include only those that make him a good citizen of any town or city. His personal and business contacts give him a sympathetic insight into the needs of his district. He is at all times ready, I would say even keen, to have his branch handle every dollar's worth of banking business. There is a distinct pleasure in loaning money to honest men for constructive purposes on proper banking lines.

Question—I wonder if Mr. Rae would tell us what the banks' responsibility is in connection with forged cheques?

Answer—if you have an account with the bank your cheques are an order on the bank to pay and if some person forges your name and we pay that order, we must refund your account with the amount of the forged cheque.

Question—I am interested in connection with the responsibility of the bank for forged cash tickets.

Answer—This and other responsibilities are set out in the Grain Schedule letter I referred to earlier in the evening. Any of the line elevator companies will have this blue form in their files.

THE TERMINAL ELEVATOR AND ITS FUNCTION

In establishing terminal elevators the primary function, undoubtedly, was to transfer grain from box cars to boats, so that the bulk method of handling could be made use of throughout. Before dealing with the functions of terminal elevators, however, I should like to recite briefly the historical background associated with the development of these elevators and to show the enormous progress that has taken place during a comparatively short period of years. It may interest you to know that the first small parcel of western wheat arrived at the lake heads in 1881. This was handled in sacks and placed aboard the little steam barge "Erin" by means of a wheelbarrow. In 1883, the first terminal elevator at the head of the lakes was built at Port Arthur with a capacity of 250,000 bushels. This elevator is still in operation, although it has been rebuilt and added to many times. So we find, therefore, that the first shipment of wheat to pass through a terminal elevator in Canada was loaded through that house on to the steamer "Acadian" in 1883. Until very recent years the problem of providing facilities for handling grain at the lake heads, to keep abreast of the capacity of western provinces to produce it, was one of continual struggle, and that was particularly the case in early days. In those days terminal elevators were looked upon merely as part of the necessary transportation system. In 1884, therefore, the C.P.R. officials realized the necessity of providing additional facilities and the second terminal elevator at the lake heads (although the first at Fort William) was built in time to handle the crop of 1885. This structure was regarded in its time as a colossal affair, having storage capacity for a million bushels. The terminal elevator business was beginning to get underway and in that year, 1885, the shipments of grain from the head of the lakes amounted to a million and a half bushels—just an ordinary day's work in our time, although it was no doubt considered a fine showing in 1885. Contrast this with the grain shipments from the head of the lakes in 1928, when over 400 million bushels of grain were loaded into vessels.

Crops were increasing rapidly and by 1887 a very large crop was produced. It is said that grain was piled mountains high in sacks at every station in the West, while a torrent of grain was pouring into Fort William which completely over-taxied the facilities of the port. The railway company continued to build terminal elevators in an effort to meet the situation and by

1889, Fort William had a total terminal elevator capacity of $3\frac{1}{4}$ million bushels.

THE GRAIN CLEANING PROBLEM

In those days, before grain fields became infested with weeds, there was no grain cleaning problem. Elevators were constructed primarily for the purpose of transferring grain from box cars to boats and later for storage purposes. As crops increased so did weed seeds, and the problem of cleaning and separating grain began to assume more importance. Today, in our modern plants, we have to be equipped to do almost any kind or class of cleaning that the situation demands, to say nothing of the requests we sometimes get to make absolutely impossible separations. Crops increased rapidly and so also did terminal elevator facilities, so that by 1905 the terminal capacity at the head of the lakes was approximately 15 million bushels. Weed seeds were increasing and tough and damp and otherwise out-of-condition crops were beginning to make their appearance and, as a natural consequence, hospital elevators were established to meet requirements.

As the country elevator business expanded, it became apparent to their owners that terminal facilities were necessary for the successful operation of such elevators, so private capital now entered the field of terminal elevators. Soon the railway companies realized that terminal operation was no longer a matter only of transferring grain from box cars to boats, but was developing into a highly specialized business. They began, therefore, to turn their elevators over to private companies and within a few years they were entirely out of the terminal elevator business; that is, insofar as Western Canada was concerned. By 1912 most of the elevators at the head of the lakes were operated by grain companies who had already developed a line of country elevators, and who were experienced in the handling, cleaning and merchandising of grain.

DEMAND FOR INTERIOR TERMINAL FACILITIES

About this time the railway companies were experiencing difficulty in moving grain forward fast enough to the lake head and congestion was arising at country elevators. A demand arose, therefore, for interior terminal facilities to relieve this situation. Accordingly, the Dominion Government built elevators at Saskatoon and Moose Jaw. Later Government interior elevators were built at Calgary and Edmonton, and about four years ago at Lethbridge. The extent to which these interior elevators have been used has varied a good deal one year with another, but

Calgary and Edmonton have proved to be quite useful as annexes to Vancouver on several occasions. The movement out of Vancouver is somewhat spasmodic at times and Calgary and Edmonton elevators have, therefore, been useful in preventing congestion in western Alberta at times when Vancouver was also congested.

In 1916 a Government elevator was built at Vancouver. In 1917, 100,000 bushels of wheat were shipped through that elevator to England via the Panama Canal and established definitely the feasibility of this route, as the grain arrived in England in excellent condition. Development at Vancouver was slow, but in 1922, 14 million bushels were shipped from the Pacific Coast, about 10 millions of which went via the Panama Canal and the balance to the Orient. Since then, growth of the Pacific grain route has been rapid and there are now ten terminal elevators with a capacity of about 21 million bushels.

The last western terminal elevator development occurred when the Dominion Government built a $2\frac{1}{2}$ million bushel elevator at Churchill. Today we find we have terminal and interior elevators from Port Arthur to Vancouver with a total capacity of nearly 150 million bushels, the most of which is concentrated at Fort William and Port Arthur, where there is now nearly 93 million bushels of elevator space. With this background in mind we can now proceed to deal with the actual operations of a terminal elevator.

PHYSICAL HANDLING OF GRAIN AT FORT WILLIAM AND PORT ARTHUR

The details given herein describe what occurs at the head of the lakes, but practically the same system applies as far as possible at all other terminal or interior terminal points. Every evening the Winnipeg Grain Inspection Department dispatches copies of their inspection sheets to Fort William by passenger train; as this train passes the yard office at Fort William, the packages of sheets are thrown off so as to eliminate any loss of time. These sheets give a complete record of the inspection of all cars passing through the Winnipeg yards during the previous twenty-four hours and the car numbers are immediately recorded in an index by the Government yard clerk.

When a train of grain cars arrives at the head of the lakes the conductor hands the way bills into the railway yard office, which adjoins the Government yard office; that is, the office of the weighing and inspection department of the Board of Grain Commissioners. From these way bills the railway yard clerk

writes out a train sheet, listing the car numbers and shipping points. The Government yard clerk is then given the way bills and he also makes out a train sheet in duplicate. The information recorded will include grade, dockage, notations as to whether or not the car has been sampled or if reinspection is to be made at unloading. It shows if any special samples have to be taken for, say, the Standards Board or the Grain Research Laboratory. The depth of the grain in the car at Winnipeg, as indicated by the line mark, is recorded. The railway yard clerk now copies the grades on to his sheet and gives the Government yard clerk the name of the elevator into which each car has to be unloaded.

Up to this point you will see the railway company and the Government inspection and weighing department now have a complete record of each car as it arrives in the yards. While this clerical work is being carried on, and, it has to be done very expeditiously, the railway investigation department examines the seals and looks for evidence of any tampering that might have occurred while the cars were en route. From the track sheets already referred to, grade tickets are written out. These are tacked on to the cars and indicate the grade and dockage, this information being required at the elevator. At the same time the railway employee is attaching to the cars other tickets showing the elevator into which they have to be unloaded. The train having been properly marked and completed, is now ready for switching. A separate track is provided for each elevator company in the receiving yards and the trains are now broken up and the cars switched on to their respective tracks. This is done by putting them over a hump, which provides a means of switching cars by gravity. The lead track, known as the hump, has a considerable incline in it and as the engine pushes the car over the top the switchman cuts off the cars for the individual elevators and they run down into the lower yard on to the respective tracks. A brakeman rides on each car in order to control the speed by means of the brake. It is here that the Government leak inspector usually keeps a sharp look out, because the banging of the cars together gives a good indication if there is any leak present. The cars are now ready to be delivered to the respective elevators. A switch engine takes a string of these cars, probably cars for half a dozen elevators, and as he arrives at the outer tracks of each elevator the switchman disconnects the cars for that elevator. The operations so far described, that is, from the arrival of trains in the receiving yard until they are placed at the respective elevators, call for speed and accuracy and good organization, as cars

roll into the yards at the lake head in the fall of the year at the rate of 2,000 or more a day. The grain cars are now on the track at the elevator ready to be unloaded, but before this is done certain preliminaries have to be attended to. An employee of the weighing department proceeds along the line of cars, again examining them for leaks, breaking the seals and opening the outer door, making a record of seal numbers. Another Government employee detaches the grade ticket from each car and makes a record of them in the Government office adjoining the elevator. This ticket bears all notations, such, for instance, as to whether or not the car is to be reinspected or surveyed or was too full to inspect at Winnipeg. The elevator office also makes a record of these tickets and this is being done, as already stated, while the grain doors are being opened, seal records recorded and the load line taken. The load line is taken by means of a measuring stick placed against the grain door by one of the weighing department employees. Naturally, the grain is seldom absolutely level, but he casts his eye across the grain and he can make a remarkably good estimate of the average depth of grain. The elevator man in charge of the unloading operations makes up a shunt slip—a shunt being the name given to a string of cars placed on the elevator track. This slip gives full information about each car. One copy goes to the elevator weighman and one to the Government weighman. The car is now ready to be unloaded and is hauled into position over an unloading pit by means of a winch, generally called the car haul. There are two methods of unloading cars generally in use. One is the manual system, which is in use at most elevators, and consists of breaking open the grain door and shovelling out the grain by means of a power operated shovel. This power shovel is an ingenious device. A drum is situated on a revolving shaft a short distance from the car. A cable is wound upon this drum and if you take hold of the end of it and walk away it will unwind easily and as far as you please so long as you do not stop. The moment you stop, however, it will wind up again and haul you back to the point you started from. A big iron-shod two handled scoop is attached to this cable and with it the shoveller goes into the car. The moment he stops he digs the shovel or scoop into the grain, the cable jerks taut and the scoop, full of grain, is drawn out of the car and dumped into the pit below. The shovellers work in pairs and two men can empty a car in this way in about twenty or twenty-five minutes. The other method is by means of automatic car unloaders, by which, when the grain door has been opened, machinery is set in

motion and the car is tipped from end to end, with apparently the greatest of ease, and all the grain emptied out of it in a few minutes. By this method a car can be unloaded in seven or eight minutes.

THE UNLOADING OPERATION

While most elevators have an internal telephone system, a system of light signals is always made use of between the scale floor and the track shed. On each track there will be the same number of pits as there are receiving legs and receiving scales; each pit, receiving leg and receiving scale working as a unit. A Government employee is posted in the track shed and another in the basement at the point where the grain leaves the pit and passes by means of a conveyor belt to the boot of the receiving leg, the purpose being to see that the grain passes from the grain car to the scale, by means of the belt and receiving leg, without any loss of grain and without any possibility of it being diverted elsewhere. The receiving weighman on the scale floor has moved a switch which changes the light signal in the track shed, or unloading shed, from red to green, indicating to the track foreman that the scale is empty and ready to receive grain. The grain having already been dropped from the car into the pit and the car having been swept out he moves a lever which opens the valve at the bottom of the pit immediately over the basement conveyor belt. The grain is conveyed on this belt to the boot of the receiving leg and then carried aloft to the scale garner by means of buckets fastened to the leg belt. As it passes over the top of the leg, the grain is discharged down a short spout into the garner above the scale and thence into the scale. When the grain is all out of the pit on the track shed the track foreman operates a switch which changes his light and the one on the scale floor from green to red. The next car of grain is moved on to the track over the pit and the grain dropped into the pit, as already described, but there it must remain until the signal is changed to green from the scale floor, indicating that the previous car has been weighed and the scale empty. And so the operation of unloading continues throughout the day.

If any grain should happen, through accident, to fall off the conveyor belt, as the grain passes from the pit to the boot of the receiving leg, the elevator foreman is immediately advised by the government man and the grain is shovelled back on to the belt which conveys it to the boot of the leg which, in turn, conveys it aloft to the scales. Automatic grain samplers are installed in most elevators for the purpose of securing an average sample of

the grain from each car. The automatic samplers are usually installed at the points where the grain leaves the belt and passes to the boot of the leg. These samples are used by the government grain inspector at the elevator to check the grade and dockage, already established at Winnipeg, or, in the case of certain cars, to determine the grade and dockage for the first time. This work is done by the grain inspector while the grain is being weighed.

Practically all terminal elevators have scales large enough to weigh a car of grain in one draft. In fact, the newer scales have a capacity of 150,000 pounds. A government weighman now weighs the grain. This work is not done by the weighman employed by the elevator—his duties consist of doing the mechanical work, but the government weighman does the actual weighing. When the scale is balanced, the weight is recorded on a cardboard ticket by means of an ingenious recording punch. Before the grain passes from the scale, this weight ticket is taken into the weighman's office and by way of verification is checked against the weight as estimated by the measurement of the grain taken by means of line mark before it was unloaded. The lever under the scale is then opened and the grain passes by gravity down into a workhouse bin immediately over the cleaners.

Cleaning and separating will be dealt with later and we will now follow the grain after it has passed through the cleaners. From there it passes to the boot of the cleaner leg in the basement. To get it into the storage bins it is now elevated again and dropped by way of a spout on to a distributing belt. These belts run from the workhouse out over the annex or storage tanks and thence into the tanks. Each annex belt has a tripper on it, which diverts the grain into whatever bin has been determined on. The tripper moves forward or backward into whatever position it is placed by the power of the belt itself. Each car of grain is deposited in a bin already designated for grain of that particular grade.

In the meantime, the elevator office, the railway office and the weighing and inspection offices are busy completing their records of that particular day's unloads. At the elevator office, stock sheets, outturns and warehouse receipts are being made up. At the government weighing and inspection office, sheets are being made up listing the cars by grades for each individual elevator. These government sheets are sent to the office of the registrar of the Board of Grain Commissioners in Winnipeg. The day following the unloading of those cars the railway company's

freight sheets are ready and are sent over to the elevator offices, so that they may complete the details of their outturn. The outturn, as most of you know, is the terminal elevator's official record, showing the consignee, car number, grade, dockage, bushels, freight, weighing and inspection and cleaning charges. Warehouse receipts are also made out and along with the outturns and stock sheets are dispatched nightly to the Winnipeg offices of the respective elevator companies. The warehouse receipts are listed on sheets and presented for registration to the registrar of the Board of Grain Commissioners. Up to this point the grain has been unloaded and weighed, cleaned and binned. The records have been completed, the freight charges have been paid by the terminal elevator to the railway and charged against the grain. The documents for this grain are now available to be used as may be required.

SHIPPING OUT GRAIN

The next step insofar as the operation of the elevator is concerned occurs when grain is shipped out. Before that happens the warehouse receipts have passed, by means of sale, from the hands of the owner or his agent to those of an exporter. The exporter presents his warehouse receipts to the Lake Shippers' Clearance Association, a mutual association of exporters banded together for the purpose of simplifying and expediting the movement of grain from elevators to ships at the head of the lakes, so that economy and efficiency may be exercised in the shipping of grain. The functions of the Lake Shippers' Clearance Association are, in some respects, similar to that of a bank clearing house. This organization, having received instructions from the shipper to ship his grain in a particular vessel, and having also received the warehouse receipts from the exporters, surrenders the warehouse receipts to the terminal and gives them shipping instructions. In due time a boat arrives at the elevator dock to receive the grain. The movement of these vessels from elevator to elevator is directed by the Lake Shippers' Clearance Association. The weighing and inspection departments' staff is advised by the elevator superintendent of the quantity and grades he has been instructed to load on the vessel. The Government men immediately examine the vessel holds to satisfy themselves as to their cleanliness and dryness and general fitness to receive grain. In the meantime, the elevator employees are preparing to load the grain. Instructions are given by the superintendent or foreman as to which bins the grain is to be taken from. The valves are opened at the bottom of the bins and the grain is

running on to the basement belts to shipping legs which carry it aloft and drop it into the shipping scales. Again the actual operation of weighing the grain is carried out by the government weighman. The grain then passes from the shipping scale by means of a spout direct to shipping bins, which are located on the dock side of the elevator. Spouts are connected to these bins and when the spouts have been extended and placed in position over the holds, the spout valve is opened and the grain passes from the shipping bin into the vessel. Grain trimmers are employed by the vessel to see that the grain is properly stowed in the holds. While the grain is being loaded, government inspectors are on the vessel drawing samples from each spout to make sure that the grain shipped is of the grade specified. It should be stated here that in order to ensure that all the grain that is weighed in the shipping scale passes without loss into the boat, the movable spout connecting the scale with the fixed spout leading to the shipping bin are fastened together and locked and the key is held in the possession of the Government weighman, so that there is no means of grain passing in any other way than from the scale to the vessel, and all under the direct supervision of weighing and inspection department employees. A Government certificate of grade is issued which forms part of the documents delivered to the shipper, and which follows the grain through to final destination.

We shall now deal with some of the internal operations of a terminal elevator:

CLEANING AND SEPARATING

The problems of cleaning and separating grain have multiplied with the increase in crops and the increase in area on which crops are grown. Until about twelve or fifteen years ago practically the only type of cleaner that was in use was the sieve type and whatever advances have been made in cleaning equipment, and they have been many, have been, since that time, due almost entirely to the development of the disc and cylinder type of cleaners. The sieve type of cleaner, although still the main part of the cleaning equipment in most elevators, has definite limitations and a modern elevator is not complete without a few cylinder and disc type of machines. The advent of these newer types of machines has increased the scope of cleaning and separating grain tremendously. Cleaning problems and the decision as to what type of equipment will give the best results resolve themselves into a question mainly of length, width and weight of grain and of dockage to be separated. The matter is invariably com-

plicated, however, by the presence of different kinds of grains of the same weight, width or length and that is one reason why it is so often difficult to predetermine what type of separation can be made. A great deal of separating of grains is now being done that was hardly dreamed of fifteen years ago, as at that time the main function of grain cleaning machinery was that of removing dockage, and, while that is still the main function, the improvement in equipment, as already stated, has enlarged the scope of the operation of cleaning and separating grain. As stated previously, the grain drops from the scale by means of a spout into a workhouse bin situated immediately above the cleaners. Usually, cleaning machines are grouped in batteries of two, three, four or five and it is customary in a modern plant to have six or eight bins connected immediately to each battery of cleaners. The cleaners may be of the cylinder or disc type or of the standard sieve type, but at all events the operator must understand his machines and know how to adjust them quickly, because each new run of grain is a new and separate cleaning problem by itself. The men, therefore, in charge of cleaning must understand their problems, otherwise any inefficiency in this respect will, sooner or later, reflect itself in the operating results. It may be found that the grain has not been properly cleaned and has to be recleaned or that more grain has been taken out with the screenings than was necessary in order to do efficient cleaning and so there is a steady job for a foreman or superintendent to see that his plant is being operated efficiently, particularly in respect to cleaning and separating, which is the very heart of its operations. As the grain passes over the machines and the separation is made, the grain and the screenings are trailed off in different directions, the cleaned grain being conveyed by means of spouts to the cleaning legs and thence to the storage bins, as already described, and the screenings to a screenings leg, and thence usually to a screenings garner immediately over the screenings separating equipment.

All terminal elevators have a dust collecting system and all cleaners are connected thereto, so that dust and light chaffy material is carried off by suction. Any heavy material carried off in this way is eventually recovered by means of settling chambers placed at convenient points throughout the dust collecting system.

The screenings separating equipment is usually located on the distributing floor immediately above the workhouse bins. Screenings equipment generally consists of a group of different

types of machines to facilitate the separating operations. First the straws and trash and dust must be removed, then the fine seeds; the heavier material passes on down to another machine which removes the wild oats and then the cracked wheat and buckwheat is removed, leaving the whole wheat, a percentage of which is usually unavoidably removed with the dockage in the original operation of cleaning. It is important for the operator to see that this whole wheat is recovered as it is not dockage, but is actual wheat for which warehouse receipts have been issued.

DRYING

Practically all terminal elevators are equipped with grain dryers, which are required for treatment of grain containing excess moisture. There are two or three different types but the principle usually employed is that of using two chambers—a drying chamber and a cooling chamber. The grain moves slowly from the drying chamber to the cooling chamber while a blast of warm air is forced through the grain in the drying chamber and a blast of cold air through the grain in the cooling chamber. The warm air absorbs excess moisture, while the cool air subsequently cools the grain. A large dryer will treat approximately 1,000 bushels of tough grain per hour, but the capacity of the dryer is determined by the percentage of moisture to be removed. It is important to keep the grain in constant motion while in the dryer so that none of it will become damaged as a result of the heat being applied to it. It is also important to see that the temperature of the air used for drying does not exceed 180 degrees Fahrenheit. A few years ago the National Research Council made a study of grain drying and it was found that grain could be dried at a temperature of 180 degrees Fahrenheit without injuring the milling and baking quality.

The drying of grain is now subject to supervision by the Board of Grain Commissioners and electrically operated recording charts are now used on all dryers indicating the temperature at which the operations are being carried on and thus a permanent record is obtained. Drying reports showing quantities of all grain dried are also sent to the Board of Grain Commissioners.

A few years ago very little scientific information was available on the subject of drying grain and its effect on the milling and baking quality. But as already stated, the subject was fully investigated by the National Research Council and information was made available in the form of a report, so that all terminal operators understand now the best methods of drying grain, so as to avoid damage.

MERCHANDISING AND MIXING

I must now touch on the functions of terminal elevators as merchandisers of grain. In the earlier years, all terminal elevators in western Canada were public terminals, that is, they handled grain only for other people and were not accustomed to own any of the grain they handled. Indeed, under the public terminal licenses issued to them under the Canada Grain Act they were not allowed to be the owners of grain and their function was regarded as that simply of warehousemen. Nearly all terminal elevators are now operated under the legal designation of semi-public terminals, which means that they handle both grain owned by others and grain which they themselves own. The merchandising function has grown to be a very important one. The fact that terminal elevators are now prepared to buy any kind or grade of grain assists in maintaining the cash market which enables farmers to dispose of their grain at any time they wish to sell. It is difficult to separate the merchandising functions of a terminal elevator from those of country elevators because, as you know, most of the terminal elevators of western Canada are operated by companies with a line of country elevators.

The development of merchandising functions of terminal elevators has been mainly in response to the demands of farmer customers who desire to sell their grain when delivered, or shortly thereafter, instead of holding it in their own ownership in terminal elevators, as they are entitled to do. Export buyers are not always available for the different kinds and grades of grain offered for sale. Consequently, if the terminal elevators were not available as a purchaser, a ready cash market would frequently be lacking. This year, of course, the Canadian Wheat Board has bought a very large percentage of the western wheat crop and in handling its wheat the terminal elevators act merely as warehousemen.

I do not propose to deal with the financial side of this merchandising function of terminal elevators, the need for capital and for credit and the bank's requirements as to security and to hedging. Such matters, I believe, have been adequately dealt with by other speakers who have appeared before this body.

A MERCHANDISING PROBLEM

One of the merchandising problems of the terminal elevator lies in the fact that grain arrives from the country in a multiplicity of grades. In a year such as we are experiencing this

year, for example, as many as 100 different grades of grain may be received by a terminal elevator. Now it may be found that for some of these grades there is practically no market and that for others there is not a satisfactory market in the same proportion as grades are received from the country. To provide satisfactory sale, therefore, a certain amount of combination of different lots of grain is required, a process usually referred to as "mixing".

It now is the theory of the Canada Grain Act that no mixing is advisable in the four top grades of wheat. Consequently the terminal elevator operator is required to bin separately all wheat of grades No. 1 Hard, and Nos. 1, 2 and 3 Northern, and to ship them out of his elevator as received. There may be differences of opinion as to whether that theory is altogether correct and as to whether or not it actually impedes the satisfactory sale of our crop at times; that aspect of the matter, however, is not under consideration here. The law is there and the terminal elevator operator is under obligation to handle the four top grades of wheat in that manner, no matter whether it is his own property or that of others.

But the theory of the Act also recognizes the fact that a certain degree of mixing is absolutely necessary with respect to other grades of grain. Consequently the terminal elevator operator may, as occasion requires, combine different lots of such grades provided they are owned by him, to produce the grade which the market demands. Without provision for such flexibility, markets for many grades might be lacking at times, while at other times farmers would be able to sell such grades, but at a less satisfactory price. Mixing may be defined as a process of separation and combination of grain in order to produce different proportions of different grades than those originally prevailing in the grain that is mixed.

Grading is often discussed on the assumption that each grade consists of kernels of wheat uniform in size, appearance, weight and quality, but nature does not produce wheat in this way. There may be great variations in the kernels produced even by a single head of wheat. There is also variation in the kernels produced by different heads in the same field. Similarly, good and poor kernels alike are to be found in every grade of wheat. Mixing therefore begins on the farm.

Every lot of grain as received is a mixture of kernels of varying sizes and types, and to a considerable extent the separa-

tion, by mechanical means, that may be applied to any lot, is an unscrambling of mixtures that have previously taken place.

All grain received by a terminal elevator is officially graded by a Government inspector before it enters the elevator. The terminal is not allowed to receive it otherwise. Similarly, every shipment of grain leaving a terminal elevator is officially graded. The same grade names apply, but the two inspection processes are somewhat different. Grain going into the terminal elevator is graded in accordance with a legal definition, and any grain which is as good as the definition of a grade, that is the minimum, is entitled to that grade. But grain leaving the elevator must do more than comply with the legal definition. It has to be equal to certain export standard samples, made up in a way prescribed by the Act; that is, it is made up by mixing 75% of the average of the grain passing inspection points with 25% of the minimum. It may happen, indeed it does happen, that a terminal elevator is obliged to accept grain as of a certain grade which it would not be allowed to ship out again alone as of that grade. The theory of the export standard sample governing shipments from terminals is that the requirements of the Act can be met because large quantities of grain are mingled together, the excess quality of one portion making up for deficiencies in quality of other portions. The elevator operator must watch his shipments carefully to see that he is shipping grain fully up to the export standard sample, and that must frequently be done by drawing grain from several different bins at once, in order to strike an average. It would mean a serious loss if the Government inspector should find any shipment lacking in quality and mark it down by a grade. It is not only advisable, but highly desirable, to ship our crop in as few grades as possible and mixing provides flexibility to the marketing of our grain and enables us, as far as possible, to meet the requirements of buyers.

GOVERNMENT SUPERVISION

Terminals are under close supervision of the Board of Grain Commissioners. Before a terminal can be built plans must be approved by the Board. The same applies to alterations.

All grain is officially weighed and inspected in and out of terminal elevators.

All terminals are under bond to the Board of Grain Commissioners and must also be licensed annually. Before a license is issued, a tariff of charges for the ensuing year must be filed with the Board and approved by them.

All scales must be inspected annually by the Chief Weighmaster and he must satisfy himself that no grain can be diverted between the point of unloading and the weighing scale, and similarly that no grain can be diverted after it has been weighed for outward shipment. Incidentally, the terminal elevators combine in the employment of a scale expert whose duties are to go from elevator to elevator the year round checking the scales.

All grain must be kept fully insured against loss or damage by fire. In the event of a loss, holders of warehouse receipts have first claim on the insurance money available. Copies of insurance certificates must be given to the Board, also a weekly statement of the amount of insurance being carried.

All warehouse receipts must be registered by the registrar of the Board of Grain Commissioners. When grain has been shipped, warehouse receipts for the quantities shipped must be presented to the registrar for cancellation within forty-eight hours.

A certified stock sheet is sent to the Board each week.

At the end of the year an annual audit or weigh-up of all grain in terminals is made by the weighing and inspection department of the Board of Grain Commissioners.

A considerable staff of government employees is maintained in each elevator. A large elevator may have up to fifteen or more Government men employed during the busy months of the year.

All of which, and quite properly so, is to provide that the warehousing of grain in terminal elevators shall be carried out according to the Act, which is very efficiently administered by the Board of Grain Commissioners.

PERSONNEL

In conclusion, I wish to state that since service is the primary function of all business, it is not sufficient to have a fine modern elevator, with all the latest devices in it, unless you have an efficient personnel. A high standard of team work on the part of its employees is perhaps the most important factor in the successful operation of a terminal elevator if efficient service is to be given and satisfactory results obtain from its operation. It has been my observation that companies operating terminal elevators at the head of the lakes and Vancouver are most fortunate in having a high calibre of men carrying out their duties conscientiously and efficiently.

QUESTIONS AND ANSWERS

Question—About how many cleaners can one man operate at the Terminal?

Answer—As a rule cleaners are hooked up together in batteries of four, sometimes six, but more often four, and one man is quite able to look after four cleaners. You understand, the same grain is passing over all four cleaners. It would be difficult for a man to look after four cleaners if different kinds of grain were going over each cleaner.

Question—Is it true that the terminal operators or managers have in no way any control over the weighing and grading of grain taken into the terminal?

Answer—Yes. The operator, owner or manager or any of the employees have absolutely no control over the weighing or inspection of grain. The Government weighmen and Government inspectors are responsible entirely for the grading and weighing.

Question—Supposing a certain car of grain arrives at the terminal and is taken in and the Government inspector wishes to place a certain grade upon it and the foreman or manager in charge of the elevator thinks the grade should be different. What happens then?

Answer—The elevator manager has his recourse; he can call for re-inspection if he wishes, but it is very unusual for that to be done. Most elevator managers usually abide by the grade of the inspector at the elevator, no matter what they may think about it.

Question—Could you give us some idea of the operation of a smut washer?

Answer—A smut washer, as the name suggests, is for removing smut from wheat. There are various types. We have one which is the cylinder type of machine that employs a large body of water, and the grain and the water meet at a certain point when the water is moving very fast, and it forces the grain through the cylinder and in the course of doing so rubs the smut off the wheat; and the smutty water (because the wheat is now clean) passes down into the sewer and the wet wheat—because it is actually wet with a good deal of surface moisture on it—passes immediately down into a small dryer working in conjunction with the smut washer, and the wheat is dried. We find it makes a very good job. The wheat may be slightly bleached

because of the amount of water passed over it, but it is good and clean and it smells sweet. Because of its bleached appearance, however, it is not likely to qualify for the grades of 1 Northern, 2 Northern or 3 Northern.

Question—If the smut washer is efficient, why is there not a cleaning charge made?

Answer—The difficulty is that no two cars of smutty wheat have the same amount of smut. One car may go through the smut washer three or four times; on another car you may find it does the job in one cleaning. There is this to be considered about it also: you have to accumulate three or four or several cars in order to do the job on anything like an economical basis. If you had to do them by individual cars the charge of course would be exorbitant because it would mean starting up fires to operate the drier, which is quite an expensive operation for one car. The elevator generally puts these cars aside until such time as they have a few of them and does them all at one time. As a general rule the spread between straight grade and smutty wheat is no more than sufficient to defray the cost of washing and drying and very often it is too narrow to warrant washing, in which case it is sold in its smutty condition.

Question—When a car has been binned according to its grade and subsequently a survey or reinspection is called, what position is the elevator in if the Appeal Board or reinspection changes the grade to a higher one?

Answer—The position of the elevator operator, in the event of the Appeal Board changing the grade of a car after it has been unloaded and binned by its original grade is simply this: that he has a car of what he believed was 2 Northern in a 2 Northern bin, but it is now graded 1 Northern. If his outturn and warehouse receipt have been issued, he must recall them and issue a new warehouse receipt for 1 Northern. At the end of the season he will find himself short a car of 1 Northern and over a car of 2 Northern. The elevators agreed to this arrangement when the change was proposed a few years ago, the reason being that cars may very often be unloaded before the shippers have received their advice notice of grade. Samples are held at the Head of the Lakes for thirty days and so they may call for re-inspection or survey within thirty days.

Question—Would Mr. Watt care to express an opinion from his long experience in terminals as to whether the inspection out of the terminal is actually more severe than the inspection in?

Answer—I may be regarded as a prejudiced witness, but there is not the slightest doubt in my mind that the inspection outward is more severe than the inspection inward. You see, the fact is, in the inspection inward you have a small army of private inspectors working for grain companies, representing shippers, endeavoring to get the grade raised if possible; whereas in shipping out of the terminal the operator is invariably confronted by the fact that the exporter engages the services of a private grain inspector to protect his interests at time of shipment, to see that the grade is at least equal to the export standard. This inspection service is of course in addition to the regular government inspection.

Question—The speaker said that while the grain is being weighed the Government inspector is examining the sample taken from the car. If it happens to be a reinspect car what would the elevator do with the grain if there was some delay in determining the grade?

Answer—That is to say, there is a car of grain being weighed. If it is in the scale and as I stated, the inspector is examining the sample and if there is some delay on his part in determining the grade, what does the elevator do with the grain in the scale? In the fall of the year when most elevators are quite busy, there is little time for delay, so it is most likely they will drop the grain into a separate bin by itself and preserve it there until the Inspection Department has determined the grade; but at this time of the year when we may be unloading only half a dozen cars a day, they will probably leave the grain right in the scale, for half an hour if necessary, while the inspector is determining the grade.

Question—From time to time in the country, statements are often made that somebody, the speaker usually, has possession of a sample of wheat taken from a boat landing at Liverpool which carried an Inspection Certificate of One Northern but only graded 3 Northern when submitted to the Inspection Department in this country. Is there any possibility of any truth in such a statement?

Answer—It does not seem conceivable that this is so. When grain leaves the Head of the Lakes, a sample of it is preserved for quite a long time and it simply is not reasonable that an inspector at the Head of the Lakes can give a grade of 1 Northern to wheat that finally arrives at Liverpool and on returning the sample here is called 3 Northern.

Question—Are the railways responsible for the contents of cars after they have been placed on the tracks of the terminal elevators?

Answer—When a car of grain has been delivered by the railway company on the track of the terminal elevator, that is on the main track by the elevator, it is considered as having been delivered and the responsibility, except as to weight, rests with the elevator.

Question—Could Mr. Watt tell us what advantage there is in the person checking the load lines on the grain cars? They have an inspector and the other is only an estimate. What do they have them there for?

Answer—The main reason for checking the load line is so that there will be on record some evidence of the depth and, therefore, the approximate weight of the grain on arrival at Winnipeg and again at Port Arthur.

Question—What system do they have in the different terminals of knowing whether or not the grain is out of condition or going out of condition?

Answer—There are one or two elevators in which they have thermometers installed in the bins, an automatic method by which they can determine the condition of the grain. These thermometers actually consist of two pieces of dissimilar metal such as copper and nickel, and which, when brought together, create a very small electromotive force. The volume of the electromotive force is governed by the temperature surrounding it. These dissimilar metals are connected by means of a wire from the bins to a recording instrument in the office, so that the temperature of the grain in a bin can be ascertained at any time. In most elevators, however, it is the responsibility of the superintendent to keep a close check on his grain by frequent examination of bins. Out of his experience he has some idea as to whether or not particular kinds of grain are liable to go out of condition. If he has any doubt he is expected to run and re-elevate that grain. He may run it often during the summer and this keeps it cool. There are times when some grain may be run every week just to ascertain its condition. It is rather a cumbersome sort of way but one may go along for a long time without having to do any of it.

Question—Would Mr. Watt care to elaborate a little more on the relationship between the terminals and the Lake Shippers' Clearing Association?

Answer—The Lake Shippers' Clearance Association was organized by exporters, not by terminal elevators. The terminals merely come into the picture by virtue of the fact that they store the grain. I think most of you know, practically all exporters deal with the Lake Shippers' Clearance Association when it comes to making their shipments. There are very few shippers who deal direct with the terminals. They may do so with the odd car of grain during the winter, but in the fall of the year practically all grain is shipped by the Lake Shippers' Clearance Association. Exporters surrender their warehouse receipts; the Lake Shippers hold the warehouse receipts until such time as the exporter has given instructions to ship the grain. The Lake Shippers are receiving warehouse receipts from twenty or thirty exporters covering grain in just as many terminal elevators, and they must necessarily keep stock records indicating how much One Northern, Two Northern and Three Northern, etc., they control in the various terminals. The question of distribution of boats rests largely with the Lake Shippers' Clearance Association. A simple illustration may suffice to show how this operates in actual practice. Imagine two exporters each preparing to ship 100,000 bushels 1 Northern wheat. They have each surrendered to the Lake Shippers' Clearance Association 50,000 bushels in each of two elevators. When the boats arrive, instead of having both boats call at two elevators for 50,000 bushels from each elevator, they will arrange for each boat to get its full load of 100,000 bushels at one elevator. Thus each boat will have called at one instead of two elevators to get its cargo. The real purpose of the Lake Shippers' Clearance Association is, therefore, to expedite the movement of grain from elevators to boats.

Milling Canadian Spring Wheat

The visitor to a flour mill does not receive the impression of an orderly process in which raw material is converted, step by step, into finished products. He finds, on the contrary, that the finished product is taken off at many stages in the process, while ceaselessly moving streams of intermediate products are subdivided and combined, dropped down spouts, lifted by elevators and moved to and fro by conveyors, in what appears to be an altogether aimless fashion. Fragments from the same kernel of wheat are soon scattered all over the mill, travelling in so many different directions and undergoing so many different treatments at the same time, that it seems quite impossible to follow their course. Because of the complicated character of the flow sheet of a large mill, I shall do little more than try to tell you something of the fundamental principles and procedures that are used. These are few and simple.

PRELIMINARY OPERATIONS

Before wheat passes into the mill proper it must be blended, cleaned and tempered. I should like first to say something about these preliminary operations. Careful attention has to be given to the matter of building up a suitable blend of wheats for a mill. Any mistake made at this stage cannot be subsequently corrected. The main requirement in flour is uniformity in baking quality. It must be the same today as it was yesterday, and as nearly as possible the same yesterday as it was last month. If seasonal variations cannot be avoided, on account of pronounced changes in the characteristics of different crops, every effort must be made to reduce such variations to a minimum. The reason for this insistence upon uniformity is that bakers demand it. They want a flour which can be depended upon to give them the same results day after day, without the necessity for making troublesome changes in their formulae and shop schedules. Generally speaking, bakers will not vary their procedure to take care of variations in the flour they receive. A flour which does not give bread of the required quality by the usual method is condemned, and as a result, the mill is likely to lose business.

UNIFORM QUALITY NECESSARY

In order to produce uniform flour, the first essential is to provide the mill with wheat of uniform quality. This can usually be done in Eastern mills, where wheat is received by the boat-load, without much trouble. It is true that rather wide variations occur in different shipments of the same grade of wheat from the Head of the Lakes, but as a rule, a mixture fairly close to the average of the grade can be obtained by blending three or four shipments together in the mill elevator. Any very abnormal parcel can be set aside and mixed off in small percentages. If these precautions are taken, no more than an occasional minor change in the percentages of the various grades of wheat in use will be required to ensure uniformity of quality within any one season.

Western mills have a much more difficult problem. Their raw material comes to them in carload lots which show wide variations in quality even within a single grade. Wheat unloaded at the mill elevator is therefore binned, not only according to grade, but also according to protein content, and in the case of the lower grades, according to the nature of the damage. Thus Three Northern graded down for frost would be kept separate from Three Northern damaged by weathering, while Three Northern containing Garnet would also be kept by itself. These three wheats, though they grade the same, are entirely different in milling and baking quality, and if they were all thrown into a bin together, no certainty could exist regarding the character of the mixture that would issue from that bin.

RESERVE STOCK SAFEGUARD

Over the large wheat-growing area of Western Canada wide variations occur in climatic conditions during the growing and harvest seasons. These variations are reflected in the quality of the wheat grown in different districts. Moreover, wheat does not flow evenly throughout the year from all the shipping points to the terminals. In the fall, southern Manitoba wheat usually comes on the market first, followed by the wheat from southern Saskatchewan. Several weeks may elapse after the movement begins before wheat grown in the northern sections becomes available. By that time supplies from the south may already be falling off. A complication for the miller thus arises. He cannot dip into the stream of wheat flowing to the terminals, with any assurance that he will obtain a mixture representative of the crop as a whole, or that he will get wheat similar in character to the wheat he obtained a few weeks earlier.

The only satisfactory safeguard against variations from this cause is a large reserve stock of wheat in the mill elevator to buffer, or dampen, the changes in the character of the incoming supplies. In just the same way the seasonal changes in the waters of the rivers entering Lake Winnipeg are prevented from appearing in the Nelson.

HIGHER GRADES PREDOMINANT

In the early part of each season the miller must decide what grades of wheat he is going to mill, what protein content he will try to maintain, what classes of wheat to avoid and what to look for. The usual problem in any season is to minimize so far as possible the effect of the individual character of the current crop. When much of the crop is damaged by frost the problem is to avoid frozen wheat. If the prevailing damage is caused by wet harvest weather, then sound, unweathered wheat is sought. If, on the other hand, we are dealing with a high grade crop, frosted and weathered wheat may be bought, even at very narrow spreads, in order to preserve the uniform character of the flour. The best all-round flour is not invariably milled from the highest grade wheat mixture. Small quantities of lower grade wheats may at times contribute a valuable quality factor to the flour that will more than offset the disadvantages associated with their use. Nevertheless, the standard flour brands of the larger Canadian mills are undoubtedly produced from high grade wheat mixtures. The blend used during the last three years at the mill with which I am most familiar, has contained an average of 66% of 1 Northern, 27% of 2 Northern and 7% of 3 Northern and lower.

I should be giving you an exaggerated idea of the extent of our knowledge if I led you to believe that our methods of measuring the qualities of wheats were sufficiently exact to enable us to express at all accurately, in terms of dollars and cents, the relative values of two different samples. The characters which go to make up milling and baking quality are so many, so diverse and so incongruous, that even if they could be accurately measured it would still be impossible to weight them and sum them up. As we have already seen, the value attached to any particular wheat character depends largely upon the types of wheat available at the time, which is only another way of saying that spreads in price between two grades of wheat will vary according to the supply.

QUALITY MAIN CONSIDERATION

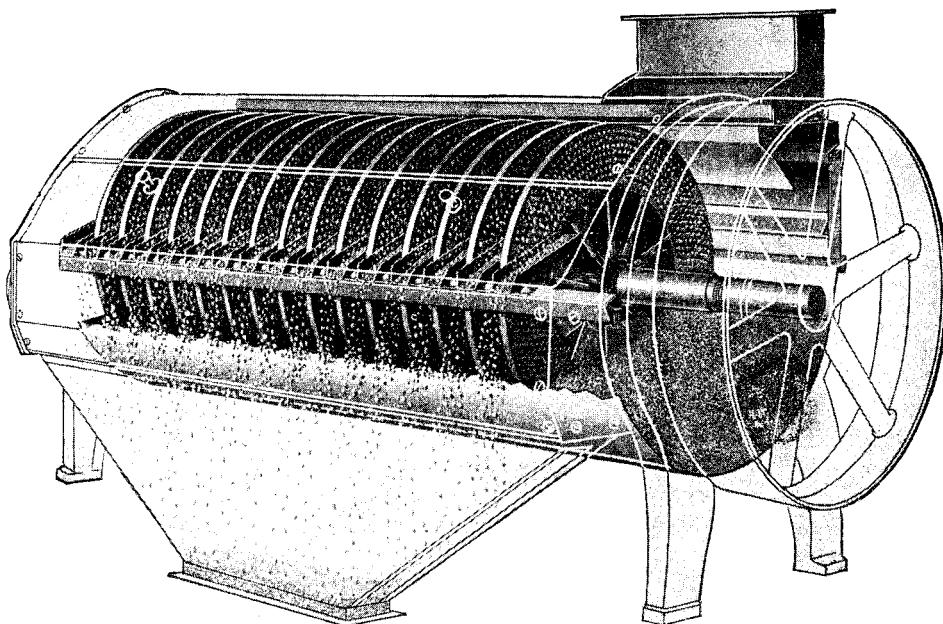
The procedure adopted by the millers in the fall of the year with regard to their wheat purchases, is based, then, not on exact

knowledge, but on opinion. That opinion, in turn, has its foundations in past experience and in the information accumulated by the mill laboratory regarding the milling and baking qualities of different grades and classes of new crop wheat. It is subject to modification from time to time in the light of practical experience in the mill and bakery, the endeavour being to obtain a wheat mixture that will give the best yield of flour of the required qualities for the lowest cost. The yield of flour and the cost of the mix are both closely watched but, as I have already indicated, the quality of the product is the main consideration.

MAKING UP A BLEND

Let us suppose that the required wheats have been unloaded at the mill elevator, passed over the separators and binned according to grade and quality. The next step is to make up a blend by drawing wheat from a large number of bins, in predetermined proportions. The mixture thus obtained is transferred to other storage bins. During the transfer, samples are taken. These are sent to the laboratory where they are tested for protein, moisture and weight per measured bushel. The percentage of damaged kernels is also counted. Any appreciable departure from the standards for protein and percentage of damaged wheat is corrected by further blending and the final mixture is then ready to go to the mill.

The wheat weighed to the mill is commercially clean. This means that it still contains about 1% of weed seeds and other foreign material, which must be removed by a rather elaborate cleaning process. The first step is to pass the stream of wheat over screenings separators. These are equipped with sieves having openings of appropriate sizes by means of which foreign seeds and other material, both larger and smaller than a wheat kernel, can be removed. At the same time a strong current of air carries away the lighter impurities to dust collectors. To separate any oats that may be present in the mixture, another machine is required. Disc machines are usually used for the purpose. A disc separator consists of a number of metal discs set close together on a shaft. The flat surfaces of the discs are covered with indentations of such size and shape that each one will just hold and carry a wheat kernel. The discs are made to revolve in a vertical plane, and as they turn, both oats and wheat are picked up in the pockets. The travel of the disc carries both upward, but the oats, because of their greater length soon fall out of the shallow pockets, while the wheat goes round to be discharged into a conveyor.



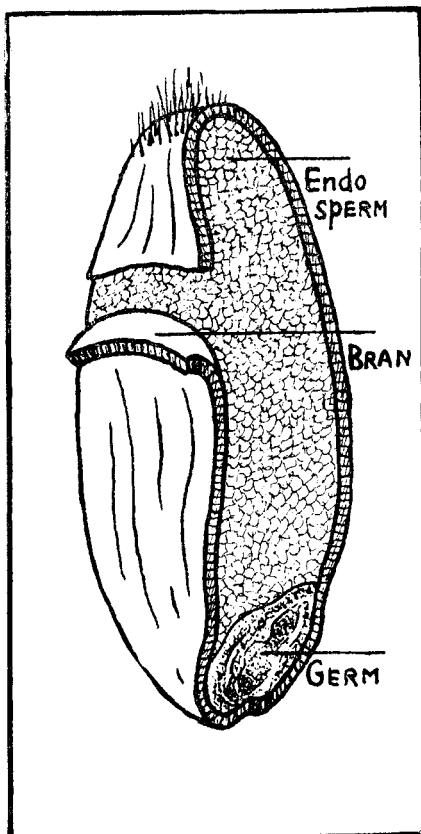
Carter Disc Separator

The wheat next passes on to the scourers where it is whipped against a rough, perforated iron casing by beaters or paddles fixed to a rapidly revolving drum. The object of this severe treatment is to free the grain from foreign material adhering to the surfaces or lodged in the creases of the kernels. The separated material is driven through the perforations in the scourer case, the lighter particles being carried away to dust collectors by a strong current of air.

THE NATURE OF THE WHEAT KERNEL

The time has now come for us to think about the nature of the wheat kernel itself. It consists of three main parts:

- (1) The endosperm, constituting about 84% of the weight of the kernel. This is the part intended by Nature to form a reserve of food material for the growing seedling. It is the part from which white flour is made.
- (2) The embryo or germ which makes up about 2% of the weight of the kernel.
- (3) The bran, consisting of a number of tough, fibrous layers of cells, which forms a protective covering for the seed. It makes up the remaining 14% of the kernel weight.



A Wheat Kernel. Part of the bran removed to show the endosperm and germ.

The object of the milling process is to separate the endosperm as completely as possible from the other two structures and to crush it to a fine powder. The performance of this task is not done with any great degree of efficiency even in the most up-to-date mills. Though the endosperm is said to make up 84% of the weight of a plump wheat kernel, yields of flour will rarely exceed 75%, and even then the flour contains appreciable amounts of powdered bran and germ. But if the separations are by no means clean-cut, we must remember that a wheat kernel only weighs about 1/40 of a gram and the separation of the closely adhering structures of so small a seed is bound to be a matter of some difficulty.

The milling process depends entirely upon the fact that the three parts of the wheat kernel have different physical properties.

The bran is tough and fibrous, the embryo, containing some 10% of oil, is soft, and the endosperm is friable, i.e. it can be crushed to a powder with relative ease. The physical properties of these structures are modified by the amount and distribution of the moisture contained in the kernel. An excess of moisture in the endosperm reduces its friability so that when an attempt is made to grind it, it tends to flake out, and failing to pass through the flour sieves, is lost in the by-products. On the other hand, if the bran is too dry it becomes relatively brittle and will then be the more readily reduced during the grinding process, to a powder sufficiently fine to pass through the flour sieves, and thus darken the flour.

THE "TEMPERING" PROCESS

The difference in the physical characters of bran and endosperm is magnified by a process known as "tempering". This simply consists of moistening the wheat and letting it stand for several hours to allow the added water to penetrate the bran. Moisture determinations are made on samples of the dry and moistened wheat at frequent intervals, the water content of the tempered wheat being maintained at a little over 15%. It is varied a little according to the character of the wheat and also according to the weather—which has a noticeable effect upon milling operations.

After standing in the tempering bins for some hours, the wheat is again scoured thoroughly and then a second addition of water is made, raising the moisture content by a further 0.5%. It is allowed to lie in a bin again, this time for about one hour, when it is at last ready to go to the grinding rolls. Except for a small stream of weed seeds considered injurious to stock and poultry, the material removed by cleaners and scourers is ground up and sold as a feed. This product amounts to about 1.5% of the weight of the incoming wheat.

MOISTURE CONTENT

The preparation of the wheat for milling is subject to little variations from plant to plant but the outline I have given will perhaps be sufficient for our present purpose. Wheat washers will be found in a few Canadian mills, but their use is by no means general. In European mills a rather more elaborate system than the one I have described is required. Before leaving this part of the subject I should perhaps say that though water is added to the wheat during tempering, there is a considerable loss of moisture in the course of the milling operations. When the natural moisture content of the wheat is low, the mill products will weigh more than

the wheat used; the reverse will be the case when the wheat received is relatively high in moisture since the water added during tempering will then be insufficient to compensate for losses due to evaporation. Over a number of years the average moisture content of the mill products will be slightly lower than the average moisture content of the wheat received, so that there is a small net loss of weight during the entire process.

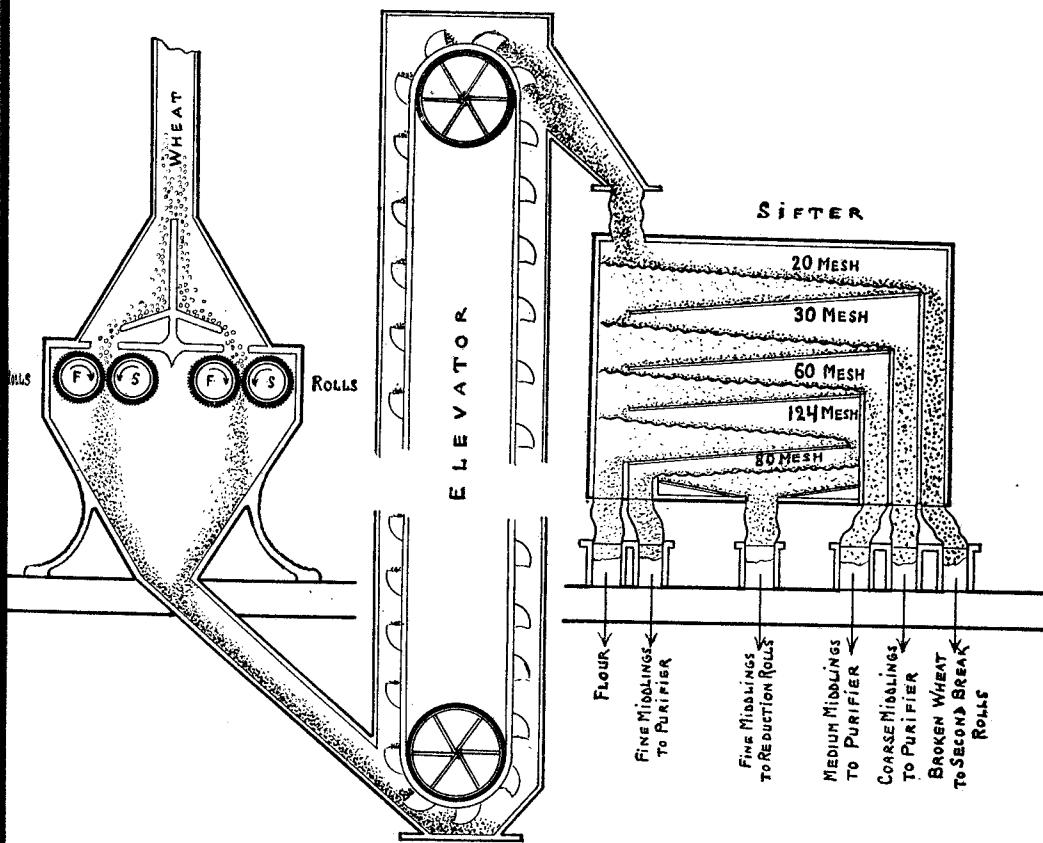
THE GRINDING PROCESS

As is well known, the wheat grown by the early settlers of the Red River Valley was ground on stones which were first turned by hand and later by windmills. Such stones were in general use from Roman times up to the latter part of the 19th century, when they were displaced by the roller mill. The rolls now used on this continent are made of chilled iron and are usually from 30 to 40 inches in length and 8 to 10 inches in diameter. Shafts project from each end. These fit into bearings and carry the drive pulleys. The rolls are set up in pairs, and in each pair there is a fast roll turning at 500 r.p.m. and a slow one moving at half that speed. Usually two pairs of rolls are set in one housing.

The first part of the grinding process is known as breaking and the rolls used are called break rolls. Break rolls always have a corrugated surface. The corrugations, of which there are 12 to 24 to the inch, run the length of the roll, but instead of being cut parallel with the edge, they are given a slight spiral. As the rolls turn rapidly towards each other, the edges of the grooves of the fast roll cut across the edges of the grooves in the slow roll, so that there is a shearing, as well as a crushing and tearing action, on the material falling in a rapid stream between them.

The roughly crushed wheat from the first break rolls falls down a spout into a bucket elevator, from which it is discharged in the first break sifter. A sifter is nothing more than a large box, fitted with a drive and filled with stacks of sieves. The coarsest sieves are placed at the top and the finest near the bottom. The sifter is given a gyratory motion which carries the crushed material, or stock as it is called, over the sieves in the manner shown in the diagram.

The stock tailing over the coarsest sieve drops down a spout to the second break rolls. These are set a little closer together than the first break rolls so that the material is crushed a little finer, the wheat kernels are opened up to a greater extent, and fragments of endosperm are released. The crushed stock is ele-



A stand of first break rolls with elevator and sifter

vated and dropped into the second break sifter. From here the coarsest material falls to the third break rolls. The process of alternately grinding and sifting is repeated until five breaks have been given. For each successive step the rolls are set a little closer together. At each grinding, more endosperm is released to be removed at the subsequent sifting, so that the material going to the rolls contains less and less endosperm. At length the stock tailing over the coarsest sieves in the fifth break sifter consists of practically nothing but flakes of the outer covering of the wheat. This is conveyed away and packed as bran. About 11% of the weight of the original wheat goes to the bran bin.

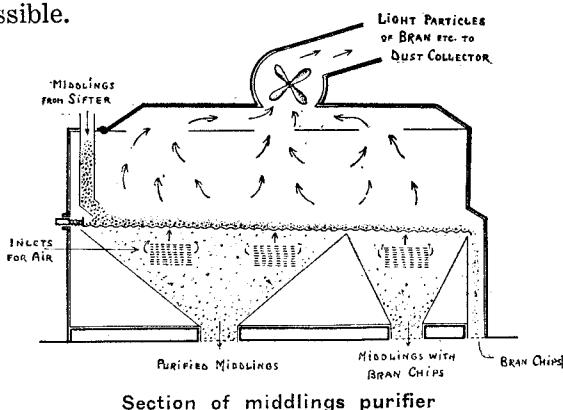
We must now turn to the other products coming from the break sifters. From each sifter a stream of flour is obtained about which we shall speak later. From the other sieves come

streams consisting of fragments of endosperm, called middlings, mixed with small pieces of bran that have been cut off by the break rolls, together with the released embryos of the wheat kernels. The sieves of the break sifters grade this material according to size. The next step is to remove, as far as possible, the branny material from the graded middlings. This is done in machines called purifiers.

ACTION OF THE PURIFIER

In the purifier, the middlings are made to travel in a shallow stream over a large sieve which is rapidly shaken backwards and forwards. Air is drawn through the sieve by means of a suction fan on top of the purifier. As the stock travels from the head of the purifier, the heavier particles, consisting of purer middlings, work to the bottom of the layer and fall through the meshes of the sieve against the current of air. The light fragments, consisting chiefly of branny material, are held in suspension, as it were, by the current of air passing upward through the sieve, so that they eventually tail over the end of the sieve. The machine thus separates the mixture it receives into a stream of relatively pure middlings, a stream consisting chiefly of bran chips and some streams of intermediate composition. Purifiers are also used to some extent to complete the work of the sifters, in grading the middlings according to size. A further separation is also made in that very light material is lifted up and carried away to dust collectors by the current of air.

Before the tempering process was adopted and the middlings purifier came into use, hard red wheats had a poor reputation for milling quality and on that account were discriminated against in price. It was only as a result of these technical advances that the production of a flour of satisfactory color from such wheats, became possible.



Section of middlings purifier

OPERATION OF REDUCTION ROLLS

After being graded according to size, purified and classified according to freedom from bran chips, the middlings are ready to be ground to flour. This is done by a very gradual process on reduction rolls. Reduction rolls operate in the same way as the break rolls, but they have smooth instead of corrugated surfaces. As the endosperm fragments drop between the rolls, the fast roll gives them a quick rub over the opposing surface of the slow roll with the result that the middlings are crushed to a mixture of finer middlings and flour. The space between the rolls must be carefully adjusted to suit the granulation of the middlings. If it is too wide, the rolls fail to perform their share of the grinding, and the unreduced stock passes on to overload other reduction rolls. If the rolls are set up too close, the middlings become flaked out instead of being crushed. Heavy grinding also pulverizes some of the bran, which the purifiers have failed to remove, to a powder sufficiently fine to go through the flour sieves and darken the flour. The object of the careful classification of the middlings according to size will now be apparent. If an attempt is made to reduce a mixture of endosperm fragments of varying size, either the smaller middlings pass through untouched or the coarser middlings must be squeezed too hard. Each stream of middlings therefore goes to its own reduction rolls which are properly set to deal with material of that particular granulation.

The reason for classifying the middlings according to freedom from branny material will also be clear. We have already learnt that bran is much tougher than endosperm and is therefore more difficult to reduce to a powder. The flakes of bran also tend to escape the pulverizing action of the rolls simply because they are so thin--because they are no bigger in two dimensions than the endosperm fragments with which they are associated and in the third dimension they are much smaller. To some extent they slip between the rolls edgeways. Still they do not escape the action of the rolls altogether. Whenever a mixture of middlings and bran fragments is ground, some bran will be reduced to powder, and the greater the proportion of bran in the middlings, the more bran powder will be produced, and the darker will be the resulting flour.

FINAL SEPARATION

After each reduction, the crushed material is elevated and spouted to its own sifter. There three things take place. Most of the bran fragments will now be relatively large in area, since they have not been reduced to the same extent as the pieces of endosperm. They can, therefore, be removed by sieves of appro-

priate mesh. The flour is separated by means of fine sieves and the remaining middlings are classified by intermediate sieves according to size. The streams of graded middlings go to their purifiers and from the purifiers to other reduction rolls. These steps are repeated until most of the endosperm of the original middlings has been reduced to flour, most of the bran chips have been removed by the reduction sifters and sent to the packing bins as shorts, and all that remains is an intimate mixture of very fine middlings and very fine bran with a little germ. Any further reduction of this mixture could produce but small quantities of dark flour, so it, too, is sent to the packers and is sold as feed middlings. About 11% of the weight of the original wheat is obtained as shorts and 2.5% as feed middlings. When milling high grade wheat, the total by-products—screenings and scourings, bran, shorts and feed middlings—will average about 26% of the weight of the wheat delivered from the elevator.

The embryos of the wheat kernels are largely released by the break rolls and appear as yellow particles in the coarser middlings. In the course of the reduction of these middlings, the embryos are flattened out, and during the subsequent sifting, are separated from the crushed middlings in the form of flakes. At one time the germ thus obtained was mixed with the shorts, but now, on account of its richness in certain vitamins, it is finding some special uses.

VARYING STREAMS OF FLOUR

We saw that from the five break sifters, five streams of flour were obtained. Flour is also produced by each of the reduction rolls and is immediately afterwards bolted from the crushed middlings. The silk sieves through which the flour is bolted are quite fine, never having less than 110 meshes to the linear inch. The flour made at each grinding falls from its sifter in a continuous stream. The number of streams of flour to be gathered up depends upon the capacity of the mill and the number of classes into which the middlings are divided. In a large mill there may be as many as twenty-five to thirty grinding operations carried out by over one hundred pairs of rolls. In such a mill, twenty-five to thirty streams of flour will be obtained. Some of these will be large in volume, some small, but the thing that I want to emphasize just now, is that they vary very widely in chemical composition, in color and in baking quality. These variations are brought about in two ways. The material going to the rolls may be anything from almost pure endosperm to a mixture consisting of a small amount of endosperm with a large quantity of bran

and germ. In the one case our stream of flour will be very pure, almost free from particles of bran and germ; in the other, appreciable amounts of these impurities will find their way into the flour, darkening its color and modifying its other qualities. The second cause for the variations in the character of flour streams is the interesting fact that the endosperm of a wheat kernel, small as it is, is far from being homogeneous. One part of it differs from another and consequently the character of any flour stream will depend upon the part of the endosperm from which it is mainly derived. Thus we find that certain streams of flour contain less than 12% protein, while other streams, produced at the same time, may be composed of flour having a protein content in excess of 20%. That the differences in baking quality and color are equally wide will be evident from the loaves and specimens of dried dough that we have prepared from a few streams.

CLASSIFICATION OF FLOUR STREAMS

It is commonly believed that different grades of flour are made by milling different mixtures of wheat—that high grade flours are milled from high grade wheats and the cheaper flours from mixtures in which low grade wheats predominate. This is not usually the case. Special wheat mixtures may be milled to satisfy the price or quality requirements of a few export markets, but as a general rule the different grades of flour are made by combining in different ways the streams of flour obtained from a uniform wheat mixture. The classification of flour streams is based mainly, though not entirely, upon color. If all the streams are combined together, we get what is called a straight grade

ALL FLOUR STREAMS BLENDED TOGETHER = STRAIGHT GRADE FLOUR

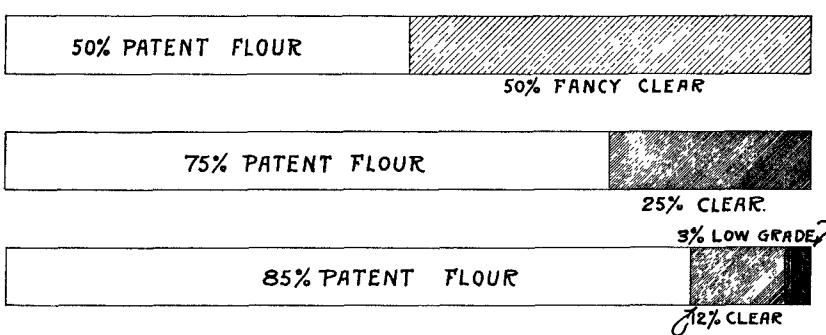


Diagram to illustrate four ways in which flour streams may be grouped to produce different grades of flour

flour. If those streams which are considered to be the best are kept by themselves, they will make up what is known as a patent flour. The mixture of the remaining inferior streams will then form a clear flour. Two grades of flour would thus be made at the same time. By turning patent into clear, or clear into patent, other grades of flour will be obtained. Or by dividing the streams into three or more classes, three or more grades might be made at once.

CONTINUOUS AND AUTOMATIC

It is necessary to realize that milling is a continuous and automatic process. So long as wheat is flowing to the first break rolls, the finished products must be just as steadily carried away to the packing department, and the intermediate products must be kept ceaselessly moving forward. Any choke or stoppage of a heavy stream will almost immediately close down the mill. Practically every machine in the mill is connected with a suction system, which carries away to dust collectors the air heated by the friction of the rolls, and laden with dust and moisture. This helps to keep the stocks cool, prevents the sieves from pasting up and keeps the mill comparatively free from dust. The volume, humidity and temperature of the air sucked through the milling system has a definite influence upon the moisture content of the stocks and hence upon those physical characters upon which their milling qualities depend. Also the silk threads of the bolting cloth are said to change in diameter with changes in humidity, causing alterations in the meshes of the sieves. To compensate for these and other changes in milling conditions, adjustments must be made in the setting of the machines in order to preserve the uniformity of the finished flours. Perhaps part of a flour stream may have to be switched from one grade of flour to another. These adjustments are made by the millers in charge, according to their skill and judgment. The first consideration of the miller is to keep his flours up to standard with respect to color and freedom from specks of bran. Then he tries to make as much flour and as little feed from the wheat with which he is provided. His next aim is to produce as much high grade flour and as little low grade flour as he can. His fourth main object is to keep the daily output of the mill as high as possible. Needless to say, he is also expected to keep expenses to whatever minimum is consistent with efficient operations and the proper maintenance of the equipment.

FLOUR BLEACHING AND MATURING

Samples of the flours are taken at frequent intervals and sent over to the laboratory where they are submitted to certain analy-

tical procedures, and to tests for color and baking quality. Of these tests I shall say nothing, as I understand you will probably be having a paper on the chemistry of wheat and flour at some future meeting. However, I think I ought to mention that it is now a common practice to bleach flours before they leave the mill. This is usually done, either with nitrogen peroxide which is a gas, or a solid substance called benzoyl peroxide, which is fed into the flour in the form of a powder. These compounds act as bleaching agents because they have the power to convert to a colorless substance the pigment responsible for the natural yellowish color of flour. No real gain is accomplished by bleaching flour, unless it can be said to increase the consumption of bread by rendering it more attractive to the eye. It is done to satisfy an almost universal preference for bread having a white crumb—a preference for which there is now no rational basis.

Other oxidizing agents are used to modify the baking qualities of flours. When freshly milled, natural flours are often not in a condition to give the best baking results of which they are capable. This particularly applies to flour milled early in the season from new wheat. Up to fifteen or twenty years ago, baking difficulties with freshly-milled, new crop flour were a general thing. The only remedy was to age the flour by keeping it in store for some time, preferably at a moderate temperature. During the aging of the flour, certain changes took place which, in some way not clearly understood, brought about an improvement in the baking qualities. At the present time, flours are quite frequently matured by treatment with some effective oxidizing agent. A substance known to the chemist as nitrogen trichloride is most commonly used for this purpose by Canadian mills.

Only very small dosages of these bleaching and maturing agents are required. For example, two or three parts of nitrogen trichloride to one hundred thousand parts of flour are usually quite sufficient to bring about the desired changes. Exhaustive inquiries in several countries have failed to show that the residues, left in the flour by the bleaching and maturing procedures I have referred to, are in any way harmful.

THE PROCESSES SUMMARIZED

I think I have now reached, if I have not already exceeded, the limits of what can be profitably said to a non-technical group regarding the actual operating of a flour mill. First of all we saw that it was necessary to provide the mill, by a process of

selection and blending, with a uniform mixture of wheat. The wheat is cleaned and scoured to remove foreign material, and afterwards tempered in order to toughen the bran so that it will be less easily reduced to a powder during the grinding operations. The cleaned and tempered wheat passes to the break rolls and break sifters. In this part of the process about half the outside covering of the kernels is separated and sent to the bran bin. The rest of the bran, together with much of the germ, passes through the coarse sieves of the break sifters and becomes mixed with the middlings. A long and elaborate process of repeated purification, grinding and sifting is then required to separate this bran and germ from the fragments of endosperm. Streams of flour are obtained from the grinding operations which are combined in groups to produce the different grades of flour. Finally, and if required, the flour is bleached and artificially matured.

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(The following reference to the use of the futures market by Canadian millers is contributed by John W. Horn, of the Western Canada Flour Mills Co. Ltd.):

Canadian millers are not speculators in wheat, but are buyers of large quantities of actual wheat which they, in turn, merchandise in the form of flour.

Owing to the fact that in normal years the milling industry of Canada purchases and grinds approximately eighty to ninety million bushels of wheat, it must be apparent that the existence of a Futures Market is of extreme importance to the industry, and Canadian millers make full use of the hedging facilities afforded by the Futures Market.

It is necessary for Canadian millers to carry heavy stocks of wheat in anticipation of future flour sales, and it is a common practice to hedge this wheat by assuming a quantity of short futures equivalent to the quantity of wheat which they purchase and carry.

A large percentage of the wheat purchased by the Canadian millers is bought from grain dealers and in the purchase of this actual wheat the millers take over from the grain dealers the equivalent quantity of short futures, or in other words, the liability in an already established hedge, or short sale.

As all wheat bought by millers is purchased for the sole purpose of grinding it and selling it as flour, it is obvious that the miller is always a potential buyer of Futures against sales of flour.

Canadian millers value very highly the insurance feature which the Futures Market affords them.

QUESTIONS AND ANSWERS

Question—What effect does the addition of chemicals have upon the nutritive qualities of flour?

Answer—This question has been the subject of careful investigation in many countries. From the evidence at present available there seems to be no reason to believe that bleaching and improving agents, in the quantities used by Canadian millers, have any harmful effects upon the nutritive qualities of flour.

Note—Probably the use of these substances will always be regarded with some trace of suspicion, since it is practically impossible to get absolute proof of their harmlessness. Anyone interested in the subject should read the Report of the Departmental Committee, appointed by the (British) Ministry of Health, on the Treatment of Flour with chemical substances. This was issued in 1927.

Question—It is a matter of catering to the likes and dislikes of certain communities?

Answer—Yes; that is the case so far as flour bleaching is concerned. Unbleached flour, having a naturally creamy color, does not satisfy the consumer, as a rule.

The situation is different with regard to improvers. These substances have a definite value. They reduce bakeshop difficulties and render unnecessary the maturing of flour by long and expensive storage.

Question—During the first part of the speaker's address he brought out the point the Western mills were under a handicap insofar as getting a proper run of wheat was concerned. He stated the Eastern mills had an advantage because they were able to buy in bulk from terminals. Is it his opinion that wheat after going through the terminals is superior to the general country run wheat for milling purposes?

Answer—Only insofar as it is more uniform. The terminal elevators do perform a valuable, if an almost involuntary service, by converting a large number of very variable parcels of wheat into a few shipments of relatively uniform quality.

Question—If a small parcel of wheat had to be obtained in order to make a very perfect mix, would it be very much easier to secure it from a selected part of Saskatchewan than from a terminal elevator at the Head of the Lakes?

Answer—Yes. If a small parcel of wheat possessing some special characteristics is required, it is best to select individual carloads. These might be selected from any part of the West.

Question—I understand one of the objections to Garnet is the color of flour produced. Is it possible to overcome that objection by bleaching?

Answer—The inferiority in the color of flour from Garnet wheat cannot be completely overcome by bleaching. The yellow pigment can be removed if enough bleach is used, but the flour remains dull in color as compared with bleached flour from Marquis wheat.

Question—What is the special food value of the wheat germ?

Answer—The main value of wheat germ appears to lie in its richness in Vitamin B. It is probably the presence of this vitamin which gives the wheat germ whatever medicinal value it possesses and also its chief value as a supplement to the dietary. Germ is also rich in the fertility vitamin—vitamin E—and on that account there is a growing tendency to extend its use in the preparation of animal and poultry feeds.

Question—About whole wheat bread. Does whole wheat flour contain germ and would it be better to eat than white flour?

Answer—Whole wheat flour contains the germ. It is generally agreed that if a person is restricted to a single food he will live longer on a diet of whole wheat flour than on a diet of white flour. He will die of starvation in either case, but whole wheat flour will maintain life longer because it contains vitamins and minerals which are lacking in white flour. To a person eating a varied diet, it is a matter of indifference whether white flour or whole wheat flour is used.

Question—I would like to know to what extent the flour extraction varies according to the test weight of the wheat. I have special reference to the large amount of rusted wheat we had this year, where the test weights went down to 48 lbs., or lower, per bushel. Will the flour extraction drop down in percentage to the same extent as the test weight?

Answer—It drops, but I am not sure just what the relation is between the fall in weight per bushel and the drop in the flour yield.

Note—Subsequent reference to the literature shows that different authorities give different figures. If we say that a drop of 1 lb. in weight per measured bushel will cause a reduction of 1% in the yield of flour, we shall not be far from the average of the reported results. A difference of 1 lb. in the weight makes less difference to the flour yield in the case of thin wheats than in the case of plump wheats.

Question—To what extent are improvers a substitute for quality in flour? I am prompted to ask the question because of what we hear about British millers using so much wheat of low quality and using improvers.

Answer—I, personally, do not think improvers can be regarded as a substitute for quality in wheat. In our experience, flours from wheats of the highest grade and the highest protein content usually give the best response to treatment with improvers. In my opinion it would not be accurate to say (except with a great deal of qualification) that British millers are using improvers as a substitute for what are called "strong" wheats.

Note—It is difficult to give a brief yet comprehensive answer to this question. Those interested should consult the pamphlet "Flour Quality: Its Nature and Control," by Dr. E. A. Fisher. This pamphlet is published by the National Joint Industrial Council for the Flour Milling Industry, 52 Grosvenor Gardens, London, S.W.1, Price 6d. Postage 3d.

Question—I believe it was said that flour is ground to pass a sieve having 120 meshes to the inch. Suppose the grinding was continued until the flour passed a 150 mesh sieve. Would this have any effect upon the texture of the bread?

Answer—I do not know just what would be the effect on the loaf texture of grinding flour to a greater degree of fineness. When a high grade flour is divided into a finer and a coarser fraction by bolting on a fine sieve, we have found very little difference in baking quality between the two fractions.

Note—The effect of fine grinding, not on loaf texture particularly, but on general baking quality, has been studied quite extensively. It is generally believed that no advantage is gained by grinding flours more finely than is done at present. Severe over-grinding of flours has a definitely harmful effect upon the baking quality.

Question—I always thought a mill made just white flour and brown bread flour. How many different flours does the average mill manufacture?

Answer—The average large Canadian mill makes about fifteen different grades and types of flour.

Question—What is the difference between bakers' flour and patent flour?

Answer—Both are really patent flours, as the term "patent" is now used in the trade, but the advertised brands of household

flour are shorter patents than the flour referred to as "bakers' flour". This means that the household flour is freer from bran particles and is, therefore, better in color. It is also lower in protein content. Because of its characteristics a short patent flour is more satisfactory than any other grade of Canadian spring wheat flour for general household use, i.e. for making cakes, pie crust and biscuits as well as bread.

The "bakers' flour" has a somewhat lower market value because it is slightly darker in color. Other grades of flour besides the so-called "bakers' flour" are sold to commercial bakers. Among these, the short patent must be included.

Question—What is the difference between Swansdown flour and ordinary flour?

Answer—Swansdown flour is a cake flour and is milled from winter wheat of low protein content. It is quite unsuitable for making bread.

Question—I take it bread must be bought on appearance to a certain extent. Which is the best loaf of bread on the table and why?

Answer—Judgment regarding bread quality is largely a matter of individual taste. It will vary from person to person and from place to place. All I can do is to tell you what I think without suggesting that my opinion is any better than yours.

I would consider this (pointing to a loaf) to be the best loaf. It isn't the largest loaf by a long way, but it has the lightest crumb color and a fine, even grain. The crust color and the shape are also good.

Question—In making whole wheat flour is there any way of separating the germ from the rest of the kernel?

Answer—Not when making whole wheat flour. When making white flour the germ can be separated though most mills find it impossible to recover more than 0.5% of the weight of the wheat milled, in the form of fairly pure germ. The rest of the germ is lost in the feeds and flour.

Question—I think it is stated that flour from small mills in the country is inferior to flour produced by the large mills; at least some of our friends tell us that. Is that due to lack of quality in the wheat supplies or a lack of proper facilities for milling?

Answer—I think the main cause for whatever unsatisfactory characteristics are displayed by small mill flours is the variability

in their raw material. The small mill usually has to depend on the local wheat. If the local wheat is good they make good flour and if it is bad they will make bad flour. Generally speaking a blend of wheats from many localities will produce a better balanced flour than the wheat from one district. The inability to produce a uniform blend of wheats is thus the chief handicap under which the small mills labor, though, of course, they cannot possibly have the facilities a large mill has for maintaining uniformity during the whole of the milling process.

Question—How does the miller arrive at the cost price of flour?

Answer—By adding to the cost of the wheat at the mill the various items which make up the manufacturing expense and overhead, and deducting from that total the return for the other products made at the same time.

Question—I was told that the selling price of flour was based on ash content or protein content. Is flour worth so much because it has a certain ash content?

Answer—The main factor in determining the commercial value of different flours from the same wheat mixture is color. The flour with the better color has the higher commercial value. In this country we do not sell flour on the basis of ash content or protein content. The various brands of flour are sold on their reputation. The miller tries to keep the ash and protein in each flour within narrow limits as part of his general effort to maintain uniformity.

In the United States some of the large bakers specify the ash and protein percentages they require. Flour quality, however, depends upon other things besides ash and protein and some of these factors cannot be precisely defined at the present time. A flour may thus come within the required limits for ash and protein and yet fail to give the desired results.

Question—Could the speaker tell us just how Russian wheat compares in protein with Canadian wheat? We hear lots about other countries, but Russia seems to be more or less in the background. I would like to hear just what the average protein value is in Russian in comparison with Canadian.

Answer—My recollection of what I have read with regard to imports of Russian wheat into England is that they are lower in

protein than the imports of Canadian wheat by 1.5 to 2 per cent. Of course both wheats vary a great deal from season to season.

Note—In a pamphlet, "The Wheats of Commerce," E. A. Fisher and C. R. Jones give "about 13%" as the average protein content of Canadian wheat imported into Great Britain while the same authorities consider 11-12% to be the average figure for imports of Russian wheat.

Question—I would like to know if the general quality of flour milled in the country varies at all as the average crop varies. If the average crop is Three Northern would the flour milled that year be poorer than in another year when the wheat grades higher?

Answer—Yes, the quality of the flour must reflect to a considerable extent the quality of the crop, even though millers do their best to minimize the seasonal variations. In 1928 when we had a frozen, low protein wheat crop, our flours were not as satisfactory as they have been in subsequent years.

Question—I would like to ask if flour deteriorates with age and if so after what period deterioration begins?

Answer—All flour will eventually deteriorate with age. How long a flour may be stored before the baking quality begins to fall off depends mainly upon the storage temperature, the moisture content of the flour and the character of the flour. The higher the temperature and the higher the moisture content the more rapidly will the changes take place.

A flour that is fully matured when it goes into storage will begin to deteriorate sooner than a flour that is not matured to the same degree. In fact, a flour that is not fully matured will gradually improve in baking quality during storage until it reaches an optimum condition when it, too, begins to deteriorate.

Question—Does the flour which has the best baking value and makes the best loaf necessarily possess the highest nutritive value?

Answer—No, there is no relationship between baking quality and nutritive value.

The Chemist, The Miller and The Baker

by

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The cereal grains, especially wheat, have been the staple food of man since the earliest dawn of history and, as the science of chemistry developed, it is only logical that a specialized branch known as cereal chemistry dealing with the chemical aspects of the growth, harvesting, storage, processing and nutritive properties of the cereal grains and their products should have evolved. The discussion this evening will be confined to a consideration of the chemistry of the vulgare or bread wheats, because this species is the most extensively grown and is of the greatest importance in international trade.

THE WHEAT KERNEL—ITS GROWTH AND DEVELOPMENT

The grain or kernel of wheat, illustrated in Figure 1, is made up of three principal parts: the bran, the endosperm and the germ or embryo which differ in function and chemical composition. The bran is a tough woody coat of several layers, protecting the interior of the wheat, and is high in protein, ash and fibre; the germ or embryo is really a tiny wheat plant ready to spring into active life under favorable conditions and while, like the bran, it is rich in protein and ash content, it differs from it in containing a high percentage of oil; the endosperm, or floury portion of the kernel, is really a reserve food supply for the young plant and consists chiefly of starch enmeshed in a network of the gluten proteins. Obviously the relative proportions of bran, germ and endosperm vary widely in different wheats, but in plump grain the bran constitutes approximately 14%, the germ 2% and the endosperm, which comprises refined white flour, 84% of the kernel.

The chemical life history of the wheat plant may be divided into three stages: (1) the germination or seedling stage, (2) the growth, and (3) kernel development.

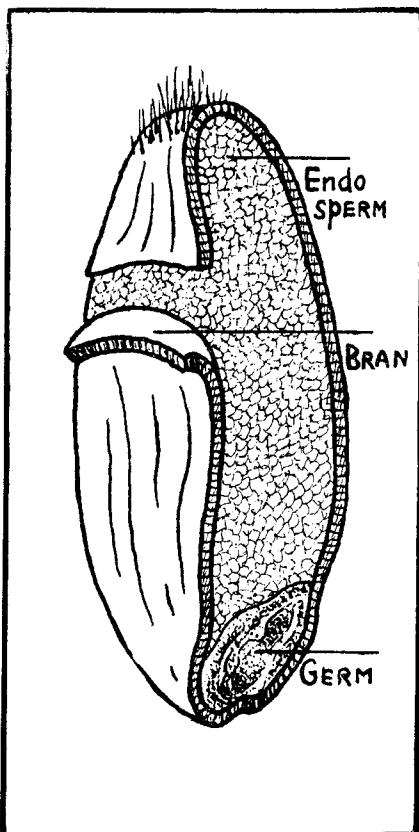


Fig. 1—A Wheat Kernel. Part of the bran removed to show the endosperm and germ.

When the sound living wheat kernel is brought into a suitable environment, water is taken up and the cells of the scutellum, that portion of the germ or embryo lying adjacent to the endosperm, elongate and take on a glandular function, secreting specific substances called enzymes, which aid in bringing about the chemical changes necessary to decompose the complex starch and proteins of the endosperm into simpler chemical units which are soluble and which the developing embryo can utilize. These changes are similar to the digestion process in animals and hence the seedling stage of plant growth is often referred to as the "animal stage". As energy, which is supplied by carbohydrates, is the first requirement of the developing embryo, it is not surprising that starch splitting enzymes, called "diastases", develop before the "proteoses" or protein splitting enzymes, and as will be

seen later, the more rapid development of diastase is of considerable importance in relation to baking behaviour.

By utilizing the products of the digested endosperm, the embryo normally develops a root and leaf system by which it is able to maintain an independent existence before complete exhaustion of the reserve materials of the endosperm has taken place.

During the growth period, the plant absorbs most of the materials encountered in the mature plant and studies have shown that true growth is practically complete at flowering.

Ordinarily, wheat is self-fertilized and this is followed by kernel development. The outer branny structure and the germ are laid down first, followed by a movement of soluble nitrogenous substances, sugars, etc., from the awns, glumes, stems and leaves into the kernel. As the moisture content of the kernel decreases, the sugars are converted to starch and the soluble nitrogenous substances to proteins.

Weather conditions during this post-floral period are of paramount importance; it has been found that short ripening periods favor a high protein content in the grain. High temperatures and the absence of excessive moisture during the ripening period tend to hasten maturation of the grain and increase the percentage of protein. Thus, the very climatic conditions which result in low yields bring about an increase in the "strength" of the wheat.

FACTORS AFFECTING THE PROTEIN CONTENT OF WHEAT

As already intimated, climatic factors are predominant in determining the protein content of wheat, although soil and variety are not entirely without influence. In general, high protein wheats are only produced in coastal regions having the Mediterranean type of climate and in the interior of large continents where the so-called "continental" or "steppe" type of climate prevails.

In regard to soil, the texture is more important than the chemical composition because upon it depends the soil's capacity to hold moisture. It must be remembered, however, that proteins are nitrogenous substances and that the nitrogen is obtained from the soil. Numerous experiments have shown that other factors being equal, an increase in the protein content of wheat

may be brought about by increasing the soil's content of nitrogen compounds which are in a form capable of being absorbed and utilized by the plant. For example, it has been found that wheat grown after legumes, which increase the nitrogen content of the soil, is higher in protein content than wheat grown after grasses.

The influence of commercial fertilizers upon the protein content of wheat has been extensively investigated in every wheat-growing country. In Western Canada, the usual method of broadcasting fertilizers has, in the main, given negative results both in regard to yield and protein content, but during the past few years extensive field trials have been conducted in which rather small quantities of fertilizers have been drilled in with the seed. These experiments have demonstrated a marked increase in wheat yield, together with earlier maturity, particularly with the application of phosphates. The increased yields have not been obtained at the expense of protein content and, as the quantity of fertilizer applied is extremely small, they cannot be ascribed to a lack of soil fertility. The plant food elements of the soil must be in solution before they can be taken up by the plant and the micro organisms of the soil play a large part in bringing this about. In the spring the soil is cold and biological activity is at a low ebb. It is, therefore, not surprising that the application of soluble fertilizing ingredients in close contact with the seed will stimulate plant growth early in the growing season by supplementing this early deficiency and thus enable the plant to develop a root and leaf system which will make the maximum use of the plant food elements of the soil as they are rendered available by biological activity when the soil warms up. This new method of applying commercial fertilizers is one of the most important recent developments in Western Canadian agriculture.

Variety in itself does not determine wheat "strength", since high protein seed grown under unfavorable climatic conditions will yield wheat that is "soft", "starchy" and "weak", or in other words, of low protein content.

In Western Canada, the effect of varying environmental conditions on the protein content of wheat is illustrated by the

results of the annual protein surveys conducted by the Grain Research Laboratory and which are summarized in Table 1. In 1927 and 1928, years of high rainfall, the average protein content was much lower than in subsequent years when the rainfall, particularly during the post-floral period, was limited. There are also wide variations in the protein content of wheat grown in any one year in the different wheat-producing areas of Western Canada. Manitoba, with a higher average rainfall than Saskatchewan or Alberta, generally produces a wheat crop of lower protein content; moreover, wheat grown in the prairie soils in the southern and central districts of Manitoba, Saskatchewan and Alberta has a tendency to be higher in protein content than that grown in the park and wooded belts of the north, where available moisture is higher and the rate of ripening is slower.

CHEMISTRY IN RELATION TO THE STORAGE AND HANDLING OF WHEAT

It is perhaps not generally realized that a normal ripe seed such as a grain of wheat is a living organism which respires or breathes in oxygen and evolves carbon dioxide, moisture and heat just as animals do. At low moisture contents and normal temperatures, the rate of respiration is so slow that the small quantity of heat produced is dissipated. However, grain is a relatively poor conductor of heat and when stored in bulk it is liable to heat if the moisture content exceeds certain limits. Careful and exhaustive experiments have shown that hard spring wheat which is sound will not heat in storage if the moisture content does not exceed approximately 14.5%. At slightly higher moistures the rate of heat production markedly increases and this sharp increase has recently been found to coincide with the germination of micro organisms on the surface of the wheat and not, as was formerly supposed, to a sudden increase in the respiratory rate of the wheat itself. If a practical means of preventing the germination and growth of these micro organisms could be found, wheat could be stored without danger of heating at relatively high moisture contents.

Table I
WESTERN CANADIAN HARD RED SPRING WHEAT SURVEYS
MEAN PROTEIN CONTENT BY GRADES AND PROVINCES FOR DIFFERENT CROP YEARS

Grade No.	Province	CROP					
		1927 %	1928 %	1929 %	1930 %	1931 %	1932 %
1 Hard	Manitoba .....	...	...	13.2	15.2	14.1	14.0
	Saskatchewan .....	...	...	14.3	14.5	14.7	14.7
	Alberta .....	...	...	14.1	14.4	14.1	14.0
	All Provinces .....	...	...	14.2	14.6	14.3	14.4
1 Northern	Manitoba	12.5	12.6	12.3	14.6	13.8	13.9
	Saskatchewan	11.9	13.0	13.8	14.1	14.5	14.4
	Alberta	12.6	12.7	13.8	14.2	14.0	14.0
	All Provinces	12.1	12.9	13.7	13.8	14.4	14.3
2 Northern	Manitoba	11.4	12.2	12.1	11.1	14.0	13.5
	Saskatchewan	11.7	12.5	13.4	12.6	13.4	13.7
	Alberta	11.8	12.3	13.4	13.0	12.4	12.9
	All Provinces	11.7	12.4	13.2	12.5	13.2	13.4
3 Northern	Manitoba	11.0	11.9	11.2	11.2	14.0	13.4
	Saskatchewan	11.4	12.3	13.1	12.4	13.2	14.9
	Alberta	11.2	11.9	13.2	12.8	12.5	12.9
	All Provinces	11.3	12.1	12.9	12.4	13.0	14.0
4 Northern	Manitoba .....	...	...	...	...	...	...
	Saskatchewan .....	...	...	...	...	...	...
	Alberta .....	...	...	...	...	...	...
	All Provinces .....	...	...	...	...	...	...
All Grades and Provinces		11.4	12.3	13.3	13.1	13.7	14.0
All protein (N. x 5.7) results		computed on a 13.5% moisture basis.				13.9	14.1

WHAT CONSTITUTES QUALITY IN WHEAT

Having traced the growth and development of the wheat kernel and the relation of moisture content to transportation and storage, we are now in a position to consider the chemistry of flour and bread manufacture. Before doing so, however, it seems advisable to consider the factors involved in wheat "quality". In the first place it is necessary to bear in mind that the term quality is a purely relative one and denotes the suitability of the material for the particular purpose it is intended to serve. The quality of wheat for bread-making purposes is linked up with two main factors designated in a general way as "milling and baking quality". Milling quality is associated with factors affecting flour yield and ease of milling, while baking quality is a term used to designate, in a general way, the suitability of the flour for bread-making.

In considering milling quality, it is necessary to bear in mind that the object of the milling process is to separate the bran and the germ from the endosperm and then pulverize the endosperm to particles of uniform size which constitute the refined white flour. The density of the endosperm is greater than that of the bran and the germ, i.e. the endosperm is "heavy", while the bran and the germ are "light" and hence, at similar moisture contents, the greater the weight of a bushel of wheat, the greater the percentage of endosperm and the higher the flour yield. It was found, for example, at the Minnesota State Testing Mill, that there was an average decrease of 0.78% of flour for each pound decrease in weight per U.S. bushel. While weight per bushel is the chief index of flour yield, the lower the moisture content of the wheat and the greater the freedom from foreign material, the higher will be the yield of flour, on the basis of the wheat as received.

The milling quality of wheat not only involves flour yield but also the ease of obtaining a maximum and clean separation of flour from the bran. The milling of some wheats has been likened to the shelling of nuts, while other wheats are somewhat "woolly" in character and the milling of the latter has been likened to separating an orange from its skin. Severely frost damaged wheats come in the latter class and the difficulty of reducing them to flour lowers the daily output of the mill and increases the overhead cost per barrel of flour.

Baking quality involves a large number of inter-related factors which are by no means confined to the characteristics of the finished bread but involve also the facility with which the dough may be handled in the bakery and the yield of bread obtainable per barrel of flour. One has to consider the suitability of the flour for baking by itself and in blends, for large machine bakeries, for small hand bakeries, as well as for home baking, for straight dough and for sponge dough baking systems, for short and long fermentations and for the particular type of loaf desired in any given locality. The chief factors involved in flour quality are uniformity, water absorption, handling quality, fermentation tolerance and bread characteristics such as external appearance, loaf volume, crumb colour, crumb texture, odour, flavour and taste.

Uniformity is an essential character of the flour a baker demands in order that uniform bread may be produced day after day without varying the baking procedure. The miller can only supply a uniform flour by drawing his wheats from large areas and blending these together in such proportions as to maintain a uniform wheat mix.

“Absorption” refers to the number of pounds of water that may be added to each hundred pounds of flour to produce a dough of the proper consistency. As bread is sold in most countries on a gross weight and not on a definite moisture basis, the higher the water absorption the higher is the bread yield.

“Handling quality” refers to the elasticity and toughness of the dough as well as its behaviour during fermentation. If the dough “slackens off”, and becomes “runny” or sticky, mechanical difficulties are encountered in the bakeshop.

“Fermentation tolerance” refers to the ability of the flour to produce satisfactory bread over a wide range of fermentation times and also when the baking conditions may not be ideal.

The particular characteristics desired in the baked loaf vary widely in different countries and even within any one country, so that they may only be considered in a very general way. The loaf should be well shaped or “bold” with an evenly browned crust; in general, a loaf of fairly large volume makes a stronger appeal to the purchaser than a small one. There is in most countries an insistent demand by the bread-eating public for a creamy white crumb. Crumb colour is influenced by a number of

factors, only some of which are inherent in the flour. The yellowish colour of flour and bread is due principally to the presence of a small quantity of a yellow pigment called "carotene". A dull or gray crumb colour is, however, more objectionable than various shades of yellow because this cannot be removed by bleaching; flours milled from low grade wheats containing immature, rusted or frosted kernels yield bread having an undesirable dull grey or greyish-brown crumb, the particular shade depending upon the extent of the damage. The crumb of the bread should contain small thin-walled cells of uniform size.

From the bread-making standpoint, wheats are classified broadly into two groups, "hard" and "soft" or "strong" and "weak" respectively. Wheats such as those grown in England, that are large berried and have soft floury endosperms, yield flour which bakes into small loaves of close textured bread and are known as soft or "weak". The flour has low water absorbing capacity and the dough made from it has relatively poor gas retaining qualities and low fermentation tolerance. On the other hand, hard wheats, such as those originating in Western Canada, are smaller grained varieties which yield strong flours, which contain a high percentage of protein and are capable of being baked into well risen, shapely loaves of good grain and texture. Strong flours require more water to make a dough of the proper consistency and are less critical in their fermentation requirements than weak flours and hence are less liable to give baking failures. In addition, they yield doughs of good handling quality, while weak flours tend to produce sticky doughs which give trouble in machine baking.

THE CHEMISTRY OF WHEAT FLOUR MANUFACTURE

While the milling process, which aims to separate the endosperm of the grain from the bran and germ, is entirely physical in character, differences in the chemical composition of the three structures are responsible for variations in physical properties which render mechanical separation possible. Because of its high fibre content the bran is tough, while the starchy endosperm is friable, and the germ, owing to its high oil content, readily flakes when passed between smooth rolls. Moreover, these structures differ in density which renders it possible to utilize air currents to advantage. The milling process is not 100% efficient, which

accounts for the production of different grades of flour varying in their purity or freedom from the mill offals.

By the system of successive "breaks" and "reductions" employed by the miller, numerous flour streams of varying purity are produced and these are blended to produce the different commercial flour grades. While milling practice varies widely, a specific example will serve to outline the general principles.

In the milling of hard red spring wheat, the numerous flour streams are first reduced to four fundamental grades of flour by combining streams which are similar in characteristics; these are lettered A, B, C and D, in order of decreasing refinement, in Table II. Grade A is the best 55% of the total flour, being the freest from bran and germ, grades B and C the next best 30 and 12 per cent respectively, and grade D the poorest 3 per cent of the total flour. These "fundamental grades" are used to produce the different flours offered by the miller, of which the most common are also shown in Table II.

Table II
GRADES OF FLOUR PRODUCED IN COMMERCIAL MILLING
FUNDAMENTAL GRADES PRODUCED

Fundamental Grades	% Total Flour	Protein %	Ash %*
Grade A	55	11.5	0.38
Grade B	30	14.0	0.55
Grade C	12	14.5	0.85
Grade D	3	16.5	1.80

TYPICAL COMMERCIAL FLOUR GRADES MARKETED

Grade	Component	% Total Flour	Protein %	Ash %*
Short Patent	A	Best 55	11.5	0.38
Medium Patent	A+B	Best 85	12.4	0.43
Long Patent	A+B+C	97	12.7	0.47
Straight Grade	A+B+C+D	100	13.0	0.56
Fancy Clear	B+C+D	Poorest 45	14.0	0.75
First Clear	C	Poorest 15 (less 3% low grade)	14.5	0.85
Second Clear	C+D	Poorest 15	15.0	1.10

NOTE—The protein content of the wheat from which these flours were obtained was 13.3 per cent.

*Protein and ash values are expressed on a 13.5% moisture basis.

If grade A, representing the best 55% of all the flour obtained from the wheat, is sold separately, it is called a "short patent," "first patent" or "fancy patent." The "medium" and "long patents" represent increasing percentages of the total flour, while in the "straight grade" all the flour produced is put together in one grade, although quite frequently some of the poorest streams are not included. The "clears" are low grade flours and represent what is left after the different percentages of the best part of the flour are taken off for the patents. In addition to the grades listed in the table, millers sometimes produce what are known as "stuffed straight" and "cut straight" flours. A "stuffed straight" flour is made by mixing a clear with a straight grade, while a "cut straight" is produced when a few of the better streams are taken off and sold separately.

It is quite obvious that the proportion of the total flour included in any commercial grade may be varied at the will of the miller according to market demand and the above is given merely as an example. In addition, the designations for the various grades are not standardized and are interpreted differently by different millers.

It will be noted from Table II that the protein and ash values increase as the grade of flour decreases, indicating increasing contamination of the mill offals. Ash may be determined rapidly and with considerable precision and, since bran contains from twenty to twenty-five times as much ash as the pure endosperm, its determination is of great value to the flour miller for controlling the mechanical operation of the mill. Because of the close relationship between degree of refinement and the ash content of flour milled from any particular lot of wheat, it is perhaps not surprising that bakers often specify, among other things, the maximum ash content in their flour contracts, very fine distinctions frequently being made. In this connection it should be borne in mind that the ash content of wheat not only varies according to variety but is also influenced by climatic conditions, and weathering may increase the ease with which the

bran may become pulverized in the milling process. Careful studies have shown that the ash content of any particular flour grade increases with the ash content of the wheat from which it was milled, and hence ash is not an absolute indication of grade in the instance of flours milled from different types of wheat. It is quite possible for two flours of the same percentage extraction to differ several points in ash content, and ash figures are of little value in predicting baking behaviour.

This brief consideration of the chemistry of flour milling would not be complete without reference to flour bleaching, which is the final step in modern wheat flour manufacture due to the strong predilection for white flour shown by the consuming public. The yellow colour of flour is due principally to an organic compound called carotene, which is present in the endosperm and hence cannot be removed by milling. Even in those varieties having the most highly pigmental endosperm, the carotene content rarely exceeds four parts per million but this substance has such a high tinctorial power that a variation of one part per million is reflected in enormous differences in the intensity of the yellow coloration.

When unbleached freshly milled flour is exposed to air, it slowly improves in colour, the atmospheric oxygen converting the easily oxidized carotene to a colourless compound. Not only, however, does the flour become whiter in colour, but its baking quality also improves. This gradual improvement in colour and baking quality which by natural processes takes several months, may now be brought about in the flour mill in the course of a few days through the use of bleaching and maturing agents, thus avoiding a delay between milling the flour and baking it into bread, thereby decreasing the danger of spoilage and eliminating storage costs.

The chief oxidizing agents used in flour bleaching are listed in Table III, in which the trade names, chemical nature, physical state, normal dosage and effect of each is given.

Table III
CHIEF OXIDIZING AGENTS USED IN FLOUR BLEACHING

Trade Name	Chemical Nature: Name	Formula of Active Agent	Inventor	Chief Patent State	Physical State	Normal dosage per barrel	Normal dosage per barrel	Effect
Alsop	Nitrogen Peroxide	N ₂ O ₄	(John Andrews, England (James Alsop, U.S.)	1901)	Gas	Calculated 10	Bleaches carotene. Nitrites present in bleached flour. No effect on baking quality.	
Beta Chlora	Chlorine + 0.5% nitrosy chloride	Cl ₂ + NOCl	J. Wesener, U.S., U.S., 1920	1914	Gas	0.5 to 1 oz. per bbl.	Bleaches caro- tene; matures flour.	
Agene	Nitrogen trichloride	NCI ₃	Dr. J. C. Baker,	1921	Gas	0.75 to 1.5 grams per bbl.	Bleaches caro- tene; matures flour; increases absorption.	
Novadelox	Benzoyl peroxide, 1 part + 3 parts Calcium phosphate	(C ₆ H ₅ CO) ₂ O	Noury and van der Lande, Holland, 1921	1925	Solid	1 lb. to 35 barrels	Bleaches carotene.	

NOTES: 1. Lower grade flours require higher dosages.

2. Novadelox with Agene—dosage about 1 lb. to 60 barrels.

3. Novadel-Agene corporation formed in 1928. Canadian factory built at Fort Erie in 1930

The first chemical used commercially to any extent in flour milling was nitrogen peroxide, a gaseous substance made electrically from air by the Alsop process. This gas bleached the carotene but had no maturing effect. Later chlorine (mixed with a small percentage of nitrosyl chloride) and nitrogen trichloride, known commercially as "beta chloro" and "agene" respectively, were introduced, which not only had a bleaching but also a "maturing" effect. The most recent bleaching agent is a solid, benzoyl peroxide, merchandized in diluted form as "Novadelox," which can be accurately proportioned. The combined use of bleaching and maturing agents such as Novadel and Agene, is distinctly advantageous, as the bleaching and maturing effects can be controlled independently. With Agene alone, the dosage must be controlled by the amount of maturation required; this varies with the characteristics of the wheat, the flour grade and the length of time the flour is likely to remain in storage before baking. The degree of maturation required may be brought about with Agene and the necessary amount of Novadelox superimposed in order to complete the desired amount of bleaching.

As might be anticipated, the use of such chemical agents has been severely questioned by government health authorities and test cases have been fought out in the courts in different countries, resulting in the victory of those who maintained the usefulness and desirability of bleaching and improving agents.

This brief survey of flour milling is sufficient to indicate that the large modern flour mill requires laboratory control in order to produce a uniform and satisfactory product. The work of the mill chemist may be divided into three classes:

1. Tests on the raw material—wheat, such as protein, moisture, dockage, weight per bushel, etc.; only by chemical analyses can the wheat be blended to secure a uniform mill mix from day to day and year to year.
2. Tests conducted on material related to the milling process itself—control, amount of tempering, analysis control of mill stream flours for protein, ash and baking quality to detect breaks in the sieves or any other irregularities in the milling process, and to assist in the proper blending of the flour streams to produce the final flour grades.
3. Tests to determine the quality and uniformity of the finished flour, which include a study of the amount and kind of bleach required to produce the desired characteristics.

THE CHEMISTRY OF BREAD MANUFACTURE

The fundamental operations involved in bread manufacture are mixing, fermentation, moulding, proving and baking.

The basic materials of a bread dough are flour, yeast and water, but salt, sugar and shortening are generally added on this continent. In addition, milk and flour improvers such as malt preparations and oxidizing agents are frequently employed as dough ingredients. In "straight" dough baking systems, all the ingredients are mixed at one operation, whereas in the "sponge and dough" method, portions of the flour and water are mixed with the yeast and certain other ingredients to form a sponge which is allowed to ferment for a time before adding the balance of the ingredients to form the dough.

Mixing—In mixing the dough, sufficient water is added to the flour and other ingredients to form a dough of the proper consistency, and the pounds water required per 100 pounds of the flour in question is designated as the "absorption." Different flours, aside altogether from variations in moisture content, require different quantities of water to form doughs of the same consistency, the extreme variations between weak and strong flours being from approximately 50% to 75%. The water is taken up by the flour proteins to form gluten—an elastic structure in which the starch grains are embedded. It is this structure which is responsible for the gas-retaining power of the dough and it is the presence of the gluten-forming substances in wheat endosperm which distinguishes this cereal from all other grains and is responsible for its unique position as a food ever since leaven was used some 4,000 years ago. The protein particles imbibe water to form interlacing filaments of gluten which act as the structural framework of the dough and trap the small bubbles of carbon dioxide produced by yeast fermentation, thus giving leavened bread its characteristic honey-comb structure. Satisfactory yeast leavened bread cannot be made entirely from the flour of any other cereal such as oats, corn or rye, because the gas escapes from the doughs almost as fast as it is formed.

Fermentation, Moulding and Proving—During fermentation, the physical properties of the gluten gradually change and carbon dioxide is produced by the yeast. In a freshly mixed dough the gluten is tough and relatively inelastic and it must be "mellowed," "ripened" or as we say "developed" in order that the gas produced by yeast fermentation may properly expand it. If the

dough is baked when under-ripe, a loaf of small volume and coarse texture will result; on the other hand, if the dough is over-ripe, it tends to become "short" and cannot be extended far without breaking, so that to secure optimum results the gluten must be "developed" to the proper extent.

This alteration in the physical properties of the gluten may be brought about in several ways. The gluten may be "developed" both mechanically and by yeast fermentation; mixing the dough in high-speed mixers may thus be used to replace part of the development which would otherwise have to be brought about by yeast fermentation. In addition, flour improvers containing oxidizing agents such as potassium bromate, added as a dough ingredient, alter the physical properties of the gluten, in some as yet unknown way and hasten the development. Natural ageing of flour as a result of storage, or artificial ageing by the use of certain bleaching agents such as "beta-chlora" and "Agene," decreases the development required in the dough, whether by mechanical means or by fermentation. The gluten of weak flours requires little development, and if this is not close to the optimum, inferior bread is obtained; in other words, weak flours are short fermentation flours and also have a short "leeway period" or low fermentation tolerance. On the other hand, the gluten of strong flours requires extensive development in order to decrease its toughness and render it sufficiently elastic to produce the optimum loaf; moreover, there can be relatively wide variations in the extent of modification of the gluten without seriously affecting the volume and texture of the resulting loaf. That is, strong flours are long fermentation flours which have a wide "leeway period" or "fermentation tolerance" and hence are less liable to give baking failures than "weak" flours.

The leavening of the dough is brought about by yeast fermentation. Wheat flour contains some sugar and this, together with the sugar which may have been added in the baking formula, is fermented by the yeast to alcohol, carbon dioxide, organic acids, etc. The quantity of sugars present in flour, or added as a dough ingredient, is normally not sufficient to maintain the gassing rate throughout the entire fermentation period but as the sugars originally present become fermented out, more is produced from starch by the enzyme diastase which is present in all flours to a greater or less extent. This mechanism is obviously extremely important in maintaining the gassing rate, particularly in the later stages of fermentation and especially when sugar has not been

added as a dough ingredient. The natural diastatic activity of flours is sometimes insufficient to maintain the sugar level throughout the entire period of dough fermentation and, when baked, the loaves give a poor "oven spring" and have a pale crust due to the deficiency in sugar which caramelizes on heating to give the natural golden-brown crust. It has already been mentioned that when wheat germinates, the diastases are produced and hence the inclusion of a certain small proportion of sprouted wheat in the mill mix would seem to be desirable in order to increase the diastatic activity of the flour. However, considerable caution must be exercised, because the conversion of starch to fermentable sugars is a complex one and intermediate gummy substances called dextrins are produced which tend to make the bread "doughy" and "sticky". Moreover, protein digesting enzymes, termed proteoses, are also produced and, if these are excessive in amount, they alter the physical properties of the gluten, reducing its water-holding capacity and making it less retentive of carbon dioxide; such doughs "slacken off" and become "runny" during fermentation.

Fortunately, during germination the diastases are developed first so that if the germination is not allowed to proceed too far, a considerable increase in diastase may be obtained with a minimum development of protein ferments. Because of unevenness of germination, considerable risk is involved in including naturally sprouted wheat in the mill mix to increase the diastatic activity of the flour, but this may be safely accomplished by adding a small percentage of malted wheat flour, since the wheat used in its preparation is germinated under carefully controlled conditions. By this recent development, the miller is independent of the supply of sprouted wheat and is in a position to control the diastatic activity of his flour at a sufficiently high level to more or less ensure adequate gas production in the hands of bakers who pay little or no attention to this important factor in designing their baking formulas. Diastatic activity is more important in gas production during the later stages of fermentation, because as the acidity of the dough increases, the activity of the diastases becomes greater, thus converting starch to sugar at an increased rate.

The conversion, by fermentation, of sugars to alcohol and carbon dioxide obviously removes some of the food value and therefore the dry matter content of the bread is less than that of the ingredients taken, the loss being from 1 to 2%.

When the dough has been properly matured in the "trough" the large mass of dough is cut either by hand or by machine into pieces, each of which, when baked, will give a loaf of the desired weight. This operation removes part of the gas and before each piece can be moulded, time must be allowed for more gas to be generated. The pieces are "rounded up" in order to put a "skin" around them to prevent escape of gas from the cut portions and allowed to "prove" for a short time before moulding to shape and placing in the pans. The dough is then allowed to "prove" or undergo further fermentation in the pans, or in the case of hearth bread, on the bench, in order for it to rise and attain proper lightness before going to the oven.

Baking—In baking, a number of physical and chemical changes occur. At first the yeast functions more rapidly due to the increase in temperature but it is destroyed at a temperature of from 140° to 150° F. and further production of gas ceases. The increased activity of the yeast, coupled with the decreased solubility of the gas in the dough and its expansion, causes the dough to rise rapidly, producing what is familiarly known as the "oven spring". In order to delay crust formation and thus secure the maximum oven spring, steam is commonly introduced into the baking oven. Later, crust formation ensues involving a drying out of the outer layer of dough accompanied by caramelization of the sugars present. During baking the gluten proteins also become denatured—a process analogous to the coagulation of egg white in boiling eggs, and their ability to hold water becomes less; at the same time the starch granules swell, become gelatinized and take up more water. The loss in weight during baking varies, but is approximately 1½ ounces for a one-pound loaf of pan bread.

FACTORS ASSOCIATED WITH BAKING QUALITY

From what has been said it is evident that the bread-making quality of a flour depends upon a large number of factors which, however, may be grouped under two main headings: (1) Factors associated with gas retention, and (2) Factors associated with gas production. If either is inadequate a small volumed, poor textured, unpalatable loaf will result.

The quantity and quality of the gluten is the chief factor in gas retention. If we wash the glutens from a hard spring wheat flour and a soft wheat flour, we find not only that the soft flour yields less gluten but also that the gluten differs markedly in physical properties. It is less coherent and will not hold together on stretching. Such glutens have inferior gas-retaining proper-

ties, are of low value in bread making and are characterized as weak. These differences are illustrated in Figures 2 and 3.

The glutens in the bottom row (Fig. 3) were "rounded up" and allowed to stand for 30 minutes before photographing; the top row represents the same glutens after heating in the baking oven at 450°F. The strong gluten retains the water vapour and consequently expands, while the weak gluten allows the vapour to escape with very little expansion.

Deficiencies in the gassing power of a flour may be readily corrected in the bakeshop, while gas retention, which is linked up with the quantity and quality of the gluten proteins, is not susceptible to actual improvement in the hands of the baker. In general, all he can do is to employ the proper combination of oxidizing agents, mechanical development and fermentation, to bring the gluten to the proper degree of mellowness. For these reasons, gassing power is to-day regarded by cereal chemists as a factor entirely apart from flour "strength" which refers specifically to the gluten quantity and quality factors. In view of these considerations, it is not surprising that the protein test has proven to be the most valuable single chemical index of strength. It must be borne in mind, however, that this test merely measures the quantity of protein present.

Fig. 2—Comparative extensibility of the glutens washed from Canadian and a typical European soft flour

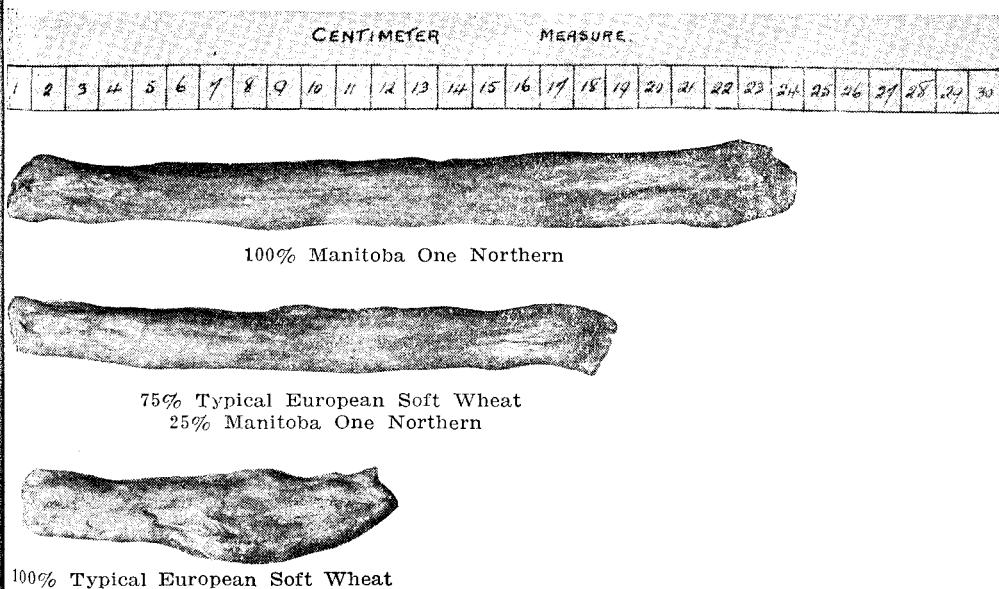
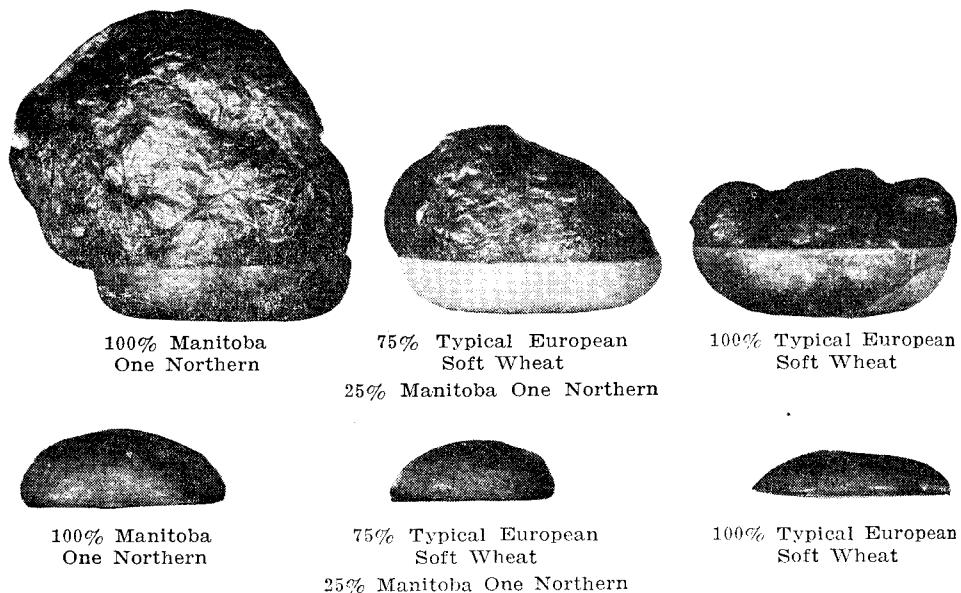


Fig. 3—Comparative stability and expansion of the glutens from Canadian and a typical European soft flour



THE INFLUENCE OF BAKING PRACTICES ON QUALITY REQUIREMENTS

From what has been said, it is obvious that different flours require different baking procedures to secure the best results. In Canada, the baker is accustomed to very strong flours and adjusts his baking system by the use of high-speed mixers and oxidizing agents to secure an optimum loaf without unduly long fermentation. On the other hand in Australia, the bakers commonly use flour milled entirely from Australian wheat; nevertheless, they, in common with the bakers of many other countries accustomed to using weaker flours, are able to make fairly good bread with the baking systems they employ.

European breads made from wheat flour vary considerably from country to country and also in different localities within the same country, but nevertheless they have certain more or less common characteristics. Compared with Canadian breads they are much more close-textured and heavier, in some instances being nearly twice as heavy per unit volume as Canadian bread. They have more of the natural flavour of wheat and, in general, less attention is paid to crumb colour. Hearth baking, that is without pans, is employed in many countries to secure more crust. The

baking formulas are simpler than those employed in Canada, ingredients such as fat, sugar and milk not being used except in the luxury types of bread. The omission of fat or shortening makes the bread tough according to our standards, but this is regarded as a desirable quality, as the slices can be cut very thin. In Scotland, consumer demand is for a loaf possessing the characteristic flavour imparted by the by-products of fermentation and hence long fermentation processes are the rule.

European bakers have learned to make saleable bread from the flours that are most economical for them to use. While preferring to adhere to their accustomed methods, they are frequently called upon to change their procedure in order to take advantage of economic conditions, or because of special legislation. Dr. C. O. Swanson, Department of Milling Industry, Kansas State College, who made a survey of European industry and baking practices for the U.S. Department of Agriculture in 1930, reported a general tendency to shorten the time of bread production, either because of economic considerations or legal restrictions. Shorter baking processes, within certain limits, allow the use of less strong and cheaper flours. Night work in bakeries is prohibited in several European countries, which necessitates the use of either a shorter or a longer fermentation time.

These varying baking practices have an influence on the flour characteristics desired by the baker, aside altogether from the type of bread preferred by the consumer. A flour that is entirely satisfactory where short systems are common, would be the cause of serious complaint where longer and more drastic baking methods are in use, as the doughs would undoubtedly be over-developed and yield poor bread. Conversely, flours suited to the long fermentation systems would yield poor bread when baked after a short fermentation as they would go to the oven in a "green" or underfermented condition; thus, commercially, the baking quality of flours must be judged with reference to the baking methods for which they are used and not on the basis of their potential strength. In evaluating wheat quality, however, the inherent strength of the flour which it is capable of producing is of major importance.

THE QUALITY OF WHEATS PRODUCED IN DIFFERENT COUNTRIES

From the blending standpoint, the English miller classifies wheats as strong, intermediate and weak. The strong wheats yield flours containing more than sufficient high quality gluten to retain the gas resulting from fermentation and hence have "reserve strength" which makes them particularly suitable for counterbalancing deficiencies in the quantity and quality of the gluten of flours milled from the weak wheats, which, if baked by themselves, would produce inferior bread. The improvement brought about by additions of strong wheats to the mill blend is reflected in increased water absorption and bread yield, in improved dough stability and fermentation tolerance, and in improved loaf characteristics such as external appearance, loaf volume, crumb grain and crumb texture.

The intermediate wheats are "neutral" or "inert," being neither especially strong nor weak; they neither help to carry a weak wheat nor themselves require support from the strong components of the grist and, when incorporated into the mixture, produce little change in dough behaviour or bread quality.

High grade "Manitobas" are universally recognized as the strongest wheats in commerce; the lower grades, which are of lower protein content, are regarded largely as fillers and of particular value for increasing the diastatic activity. The next strongest wheat is Russian, although it is very variable in quality and much of it is said to be only suitable for use as "fillers". American hard red winter, as exported, and Argentine Plate wheats are classified as typical fillers. Australian is the best of the weak wheats, being valued particularly for its high yield of flour which possesses good colour and flavour imparting qualities. Some Australian and more notably Indian wheats (Karachi), produce flours which, if baked by themselves, yield clay-like doughs but are desirable in blends because they improve the handling qualities of the dough by increasing its resistance to flow.

The results of experimental milling, baking and other analytical tests recently conducted in the Grain Research Laboratory on a series of typical world wheats are recorded in Table IV.

Table IV
MISCELLANEOUS DATA—TYPICAL WORLD WHEATS

Origin	Type	Predominating class	Weight per bushel (N x 5.7 (clean -13.5% wheat) M.B.) lb.			% Total flour	Ease of Milling	Texture activity tension (mg. p.p.m. maltose per 10 gm. flour)	Diameter of granular texture	Carbohydrate content %	Absorption volume cc.	Loaf* %
			Wheat protein	Dockage %	Total hour %							
Argentina	Bahia Blanca	Hard red winter	11.4	6.3	3.0	74.4	V. good	Granular	112	2.19	55.0	668
Argentina	Up River	Hard red winter	13.0	6.2 1/2	1.5	73.9	Good	Soft	76	1.62	51.5	570
Argentina	Rosafe	Hard red winter	12.6	6.4	1.5	73.4	V. good	Granular	108	1.48	54.5	570
Australia	W. Australia F.A.Q.	Soft white	9.8	6.4	1.0	75.6	Good	Soft	94	2.52	51.5	530
Australia	S. Australia F.A.Q.	Soft white	10.5	6.1 1/2	1.0	74.6	Good	Soft	90	2.27	51.5	580
Australia	Victoria F.A.Q.	Soft white	10.0	6.1 1/2	1.5	74.5	Fair	Soft	98	2.38	50.5	523
Austria	Lower Austria	Hard red winter	9.9	6.2	2.0	73.2	Fair	Soft	108	3.12	52.5	575
Canada	Wpg. Arge. 1°	Hard red spring	13.8	6.5 1/4	..	76.5	Excellent	Granular	108	1.81	58.5	875
Canada	Wpg. Arge. 4°	Hard red spring	12.5	6.4 1/2	..	74.1	V. good	Granular	152	2.05	59.0	795
England	Eng. red F.A.Q.	Soft red winter	9.2	6.4	..	75.8	Poor	V. soft	82	2.60	49.5	440
France	Loire district	Soft red winter	10.1	6.4	1.0	77.7	Poor	Soft	84	1.98	48.5	470
Germany	Holstein district	Soft red winter	9.1	6.3 1/2	1.0	75.1	Fair	Soft	66	2.07	48.0	483
Hungary	Gyor district	Soft red winter	12.6	6.6	0.5	76.0	V. good	Granular	120	1.86	50.0	560
Italy	Var. Mentana	Soft red winter	9.7	6.1	0.5	76.3	Fair	Soft	64	1.34	50.5	473
Italy	Var. Fausta Sestini	Hard red winter	10.7	6.2	..	75.2	Fair	Soft	66	1.88	52.5	478
Russia			13.2	6.5 1/2	2.0	77.1	Excellent	Granular	126	1.61	55.5	675
United States	No. 1 D. Hd. Winter	Hard red winter	12.7	6.5 3/4	2.0	78.3	V. good	Granular	114	1.87	56.5	753
United States	No. 1 D.N.S.	Hard red spring	14.6	6.2 1/2	..	75.5	Excellent	Granular	110	2.23	57.5	815
Yugo Slavia	Soft red winter	9.4	6.0	3.0	74.1	V. poor	V. soft	74	2.71	48.5	483	

*Baked according to malt-phosphate-bromate procedure.

V=Very.

THE CANADIAN WHEAT GRADES IN RELATION TO QUALITY

The object of any grading system is to classify the product under consideration into groups of differing quality in regard to its suitability for the particular purpose which the product is intended to serve. Theoretically then, the ideal method of grading hard red spring wheat would be to determine, (1) the flour yield per bushel of wheat and ease of milling, and (2) the quality of the flour for bread-making purposes. Obviously such methods are impractical from the standpoint of time, cost and the volume of tests which would be required. In practical grain grading, therefore, any criteria that are applied must be based on either physical appearance or quantitative measurements that may be readily applied, which are known to be related to milling or baking quality.

The Canadian grading system classifies hard red spring wheat on the basis of variety, weight per bushel, percentage of vitreous kernels, soundness, cleanliness and the amount of moisture present, into three main groups, namely: (1) the statutory grades, (2) the commercial grades and (3) the "off-grades". The statutory grades are five in number and include only the wheats of highest quality; as they are defined by Act of Parliament they are not subject to change from year to year. The commercial grades comprise wheats not eligible for the statutory grades, and their characteristics may vary annually depending upon the prevailing types of damage, such as rusted, frosted, immature and sprouted kernels. As these grades are not defined in the Act, their inclusion in the grading system provides a certain degree of flexibility. The "off grades" include all wheat which for various reasons cannot be classed within the statutory or commercial grades. Wheat in this class comprises kernels damaged by heating, bin-burning, mustiness, smut, sprouting, etc. All wheat so damaged is assigned to the statutory or commercial grade to which it would normally belong, and a notation is made on the grade certificate giving the reason for rejection.

The definitions of the statutory grades are summarized in Table V, which gives the minimum requirements for the admission of wheat into any particular grade.

**STATUTORY GRADES OF WESTERN GRAIN
RED SPRING WHEAT**

Number and name of grade	Minimum weight per bushel in pounds	Variety of grain	Percentage by weight of hard vitreous kernels	Standard of quality	Maximum limits of:			
					Foreign material other than dockage		Wheats of other classes	
					Matter other than cereal grains	Total including cereal grains %	Durum	Total Durum including Durum %
No. 1 Manitoba Hard	62	Marquis or equal to Marquis	80	Sound and well matured	Free	Free	..	..
No. 1 Manitoba Northern	60	Marquis or equal to Marquis	65	Well matured, practically free from damaged kernels	Free	Practically free	Practically free	1
No. 2 Manitoba Northern	58	Marquis or equal to Marquis	50	Reasonably well matured, reasonably free from damaged kernels	Free	About 1%	1	3
No. 3 Manitoba Northern	57	Red Spring wheat of fair milling quality	25	Reasonably well matured, reasonably free from damaged kernels.	Reasonably free	About 2%	3	10
No. 4 Manitoba Northern	57	Red Spring wheat	..	Reasonably well matured, but excluded from preceding grades on account of frosted or otherwise damaged kernels	Reasonably free	About 2½%	4	10
	55	Red Spring wheat	..	Rusted or shrunken but otherwise reasonably sound	Reasonably free	About 2½%	4	10
No. 1 C.W. Garnet	60	Garnet	65	Well matured, practically free from damaged kernels	Free	Practically free	Practically free	5
No. 2 C.W. Garnet	58	Garnet	50	Reasonably well matured, reasonably free from damaged kernels	Practically free	About 1%	1	10

NOTE—Garnet Wheat excluded from the two grades established for this variety on account of admixtures of other varieties of Red Spring Wheat, may be graded No. Three Manitoba Northern.

It will be noted that the minimum specifications are less stringent with each lowering in grade, particularly as regards weight per bushel, varieties admitted, vitreous kernel content and soundness—factors which are related to keeping quality, milling quality and baking quality. Thus, test weight per bushel is a good index of flour yielding capacity, the percentage of hard red vitreous kernels to protein content and hence to baking quality, the presence of damaged kernels influences the milling characteristics and affects gluten and hence baking quality, the extent depending upon the amount and type of damage present. On the other hand, the presence of foreign material may affect either flour yield or baking quality. Varieties of wheat may differ in regard to both milling behaviour and baking quality and, in grades Nos. 1 Hard to 2 Northern inclusive, only varieties are admitted which have been found similar to Marquis in milling characteristics and equal to it in baking quality. In the grading system, moisture is also considered, since this factor is related to the keeping quality of the grain during transport and storage and also to its milling value. Wheat containing up to 14.5% moisture is graded "straight," that containing from 14.6% to 17.0% moisture is graded "tough" while wheat containing moisture in excess of 17.0% is graded "damp" of the grade to which it belongs. The wheat standards are thus established on a scientific basis and there is a large background of technical and chemical knowledge which supports each of the grading limits.

While such factors are, of necessity, used in routine inspection, the Grain Research Laboratory possesses equipment for carrying out experimental milling and baking tests and, by working in close co-operation with the Inspection Department, a constant check is kept upon the quality of the various grades.

The chemist-in-charge of the laboratory is an ex-officio member of the Western Committee on Grain Standards, which is responsible for setting the Standards used by the inspectors as references in grading. In 1928, provision was made in the Canada Grain Act necessitating milling, baking and other laboratory tests on the tentative wheat standards prepared by the Chief Inspector. A comprehensive report of the laboratory results on the final standards established by the Western Committee on Grain Standards is prepared by the laboratory and published in the leading grain journals of the world. The report also includes tests on "Winnipeg Averages," which are composites

made up of small portions of the wheat taken from each car of corresponding grade passing through Winnipeg. As a result of this laboratory control, the wheat standards are selected to show a gradation in quality with grade, and prospective buyers are made aware of the quality of the different grades of each new wheat crop.

Average samples of the various wheat grades from the different inspection points are tested at frequent intervals, to assist in maintaining uniformity in grading.

While the baking quality of wheat depends on such a large number of factors that the quality of individual samples can only be determined with precision by an actual baking test, recent studies have shown that baking strength is closely related to protein content and, provided the comparisons are made between sound wheats of the same type, the higher the protein content, in general, the greater is the baking strength and blending value. For this reason, the laboratory makes an annual survey of the protein content of the top four grades of wheat. From 10,000 to 12,000 samples are analyzed from approximately 2,000 shipping points in Western Canada and the results are published as early in the crop year as possible in the form of a coloured map showing regions where grain of high, medium and low protein content is grown. In addition, a mimeographed report is issued, showing the results on each sample analyzed, classified according to province, shipping point and grade. These data are of great value to agronomists in zoning areas suitable for particular crops and to the grain trade in Canada and abroad in selecting wheat to suit their particular requirements.

As a further check on the quality of our hard red spring wheat shipments, samples of all cargoes shipped from the different Canadian ports are analyzed for protein content, the findings being reported to the Board and the Chief Inspector at frequent intervals. These reports permit a comprehensive study of the comparative protein content of corresponding grades from the various

ports and also assist the Chief Inspector in dealing with complaints from importers claiming compensation for shipments of inferior quality. Indirectly the protein testing of all cargoes has a tendency to increase the uniformity of quality of cargo shipments of corresponding grade.

From time to time the Inspection Department receives samples for inspection of varieties about which little or no information is available regarding the quality as compared with Marquis. Before being awarded a grade, a sample is submitted to the laboratory for milling and baking tests in comparison with Standard One Northern, since the Canada Grain Act requires that wheat graded No. One Hard or No. One Northern must be equal in quality to Marquis.

In certain crop years, unfavourable weather conditions during the harvest season result in wheat reaching the terminals, carrying excessive moisture, which necessitates artificial drying. A recent regulation of the Board of Grain Commissioners requires that all dried wheat be tested in the laboratory by means of actual milling and baking tests before the final grade is awarded. This is done by comparing the quality of the artificially dried with that of the air dried sample. When injury has not occurred, the wheat is graded "straight" to the grade to which it would normally belong; if, on the other hand, injury has resulted, the word "dried" is appended to the grade. Such wheat suffers a discount in price but, as a result of the laboratory supervision, the quantity of improperly dried wheat is now negligible.

Almost every year wheats are received for inspection containing bleached and frosted kernels either separately or combined. The laboratory has accumulated considerable information on the quality of such wheats, the investigations showing that where the frost damage is confined to the bran, and the bleaching has not resulted in sprouting, the injury to actual quality is less than the physical appearance of the grain would indicate. This has resulted in the inclusion of larger quantities of kernels of

these types in the Two and Three Northern grades, resulting in higher grades for the producer than was formerly the case when little or no information was available regarding these classes of wheat.

Probably the most important regulatory duty of the laboratory is the supervision of moisture testing in the various inspection offices, a task assigned to the laboratory since 1926. The variables influencing moisture results by the Brown-Duvel apparatus—the method employed in grain inspection—were early made the subject of extensive study which resulted in changes in both the method and equipment. The laboratory is responsible for installations of equipment and purchases of renewal supplies, the apparatus being checked for accuracy before being released to the inspection offices. Check test samples are sent out fortnightly to all inspection offices and the results of the various operators compared with those obtained in the laboratory. Any irregularities are thus quickly ascertained and corrected. This method of control has largely removed the danger of improper moisture testing and the owner of the grain is assured of reasonably accurate moisture determinations in the Board's inspection offices.

Owing to the variable nature of wheat and the complexity of the characteristics to be evaluated, it is impossible to devise a grading system which will indicate accurately the value of each individual sample and at the same time be capable of practical application. Laboratory studies have clearly shown, however, that on the average the Canadian grading system does classify hard red spring wheat into groups of decreasing milling and baking quality with each decrease in grade. This is illustrated by the results of laboratory tests on Winnipeg "Inspection Averages" of the various grades of the 1935 crop summarized in Tables VI and VII.

Table VI

**WINNIPEG AVERAGES, 1935 CROP
MILLING AND MISCELLANEOUS DATA**

Grade No.	Weight per bushel (clean wheat)	Total flour %	Wheat protein %	Bushels (60 lb.) and pounds		Flour Protein %	Ash %	Flour Carotene p.p.m.	Diasstatic activity (mg. maltose per 10 gm. flour)
				wheat per barrel flour	Total flour bu.: lb.				
1 Hard	64 $\frac{1}{4}$	74.8	4.22		15.0	13.9	0.43	1.83	124
1 Northern	63 $\frac{1}{4}$	74.8	4.22		14.9	14.1	0.44	1.88	116
2 Northern	62	73.7	4.26		14.5	14.0	0.45	2.14	120
3 Northern	62	72.9	4.29		13.8	13.2	0.47	2.48	136
4 Northern	61	72.5	4.30		13.7	13.1	0.48	2.50	156
5	61	72.4	4.31		14.2	13.2	0.47	2.17	182
6	60 $\frac{1}{4}$	71.1	4.36		14.1	13.2	0.54	2.04	226
4 Special	54	68.8	4.45		13.3	12.7	0.49	3.25	218
5 Special	52 $\frac{1}{2}$	65.6	4.59		13.3	12.4	0.47	3.60	214
6 Special	51	63.8	5.7		13.1	12.2	0.46	3.65	250
1 C.W. Garnet	64	74.9	4.22		11.4	10.5	0.46	2.86	184
2 C.W. Garnet	62 $\frac{1}{2}$	73.6	4.26		11.3	10.6	0.50	3.04	182

Table VII
WINNIPEG AVERAGES, 1935 CROP
RESULTS OF COMPARATIVE BAKING TESTS

Grade No.	Absorp- tion %	Loaf Volume CC.	Loaf Appearance (perfect score 5)	Crumb grain and Texture (perfect score 10)	Crumb Colour (perfect score 10)
Unblended Flours					
1 Hard	61.1	975	5.0	6.5	7.5
1 Northern ..	61.3	935	5.0	6.5	7.0
2 Northern ..	61.2	955	4.5	6.5	6.5 yellow
3 Northern ..	60.6	900	5.0	6.5	6.5 yellow
4 Northern ..	62.0	880	4.5	6.0	6.0 yellow
5	65.4	745	4.0	4.5 coarse	4.0 grey yellow
6	66.6	625	2.0	3.0 coarse	2.5 grey
4 Special	60.4	915	5.0	6.0 coarse	5.5 yellow
5 Special	60.2	860	5.0	6.0 coarse	5.0 dull yellow
6 Special	59.6	850	5.0	6.0 coarse	5.0 dull yellow
1 C.W. Garnet	59.9	595	2.5	4.0 coarse	4.0 dull yellow
2 C.W. Garnet	59.3	650	3.0	4.0 coarse	4.0 dull yellow
Flours Blended with Equal Parts English					
			(1) In- crease %		
1 Hard	58.7	760	45	4.0	6.5
1 Northern ..	58.8	760	45	4.0	6.0
2 Northern ..	58.7	730	39	4.0	6.0
3 Northern ..	58.7	710	25	4.0	6.0
4 Northern ..	58.6	690	31	4.0	6.0
5	60.6	650	24	2.5	5.0 coarse
6	61.4	590	12	2.0	3.5 coarse
4 Special	58.6	700	33	4.0	6.0
5 Special	58.2	690	31	4.0	6.0
6 Special	58.2	660	26	4.0	6.0
1 C.W. Garnet	58.3	585	11	2.5	5.0 coarse
2 C.W. Garnet	57.8	610	16	3.0	5.0 coarse

(1) Percentage increase in loaf volume imparted to the English flour; (volume of English baked unblended=525 cc.)

QUESTIONS AND ANSWERS

Question—I have heard some discussion about gluten content and have been asked the question within the last few days as to the installation of testing machines to determine gluten content. Is that possible and could you give us some information about that?

Answer—A gluten test may be made by washing out the starch from a definite amount of flour and weighing the residual

ball of gluten both while wet and after drying; recently several gluten washing machines have been developed to carry out this operation mechanically. The protein test is a more precise method of estimating gluten content as the procedure is accurate and well standardized so that different analysts are able to secure results in close agreement.

A protein determination merely measures the quantity and does not provide any information on the so-called "gluten-quality," which depends upon physical properties such as elasticity, ductility, extensibility, etc. In recent years several machines have been developed for the mechanical testing of doughs, the latest one being the Brabender farinograph. This instrument gives a record of the force required to distend the dough through the operation of the mixing arms. With a strong flour, the maximum force is reached more slowly and drops less rapidly with continued mixing than in the instance of a weak flour. In making comparative tests, sufficient water is added to bring doughs made from different samples to the same consistency and the instrument thus provides a ready means for determining flour absorption. The Brabender farinograph has had much publicity and is being tested in several laboratories against comparative baking tests. It is too early to predict its ultimate value, but it is fairly generally agreed that it provides valuable information on dough characteristics.

The testing machines to which you have reference may probably be a farinograph or other mechanical dough testing device.

Question—Is it fair to say that during the last five or six years there has been an increased activity in chemical discovery and mechanical invention with reference to wheat and, if so, have chemical discovery and mechanical invention militated against the use of Canadian wheat in Europe?

Answer—In recent years great advances have been made in the application of science to large industries through industrial research, and the milling and baking industry has been no exception. Public and private wheat and flour research organizations have been established in many countries and distinct advances have been made along such lines as heat conditioning of wheat, heat treatment of flour, the development of bleaching agents, flour improvers and our knowledge of the factors affecting baking quality.

Several papers have been published showing that heat conditioning of wheat and the heat treatment of flour, under controlled

conditions, toughen the gluten and increases the flour strength. On the other hand, chemical improvers do not alter the inherent strength of a flour and, according to Dr. R. A. Fisher, Research Association of British Flour Millers, do not enable a miller to reduce the percentage of Manitoba wheats and increase the percentage of the softer wheats in his mixture.

My own impression is that technological advances in the milling and baking industry are relatively insignificant factors in regard to the decreased utilization of Canadian wheat compared with the increased European wheat production and special legislation regarding its use, the decrease in bread consumption and the tendency to employ shorter fermentation times in bread baking which permits the use of less strong flours.

Question—Inasmuch as the percentage of Canadian wheat used in the mix of continental European countries is considerably less than it was a few years ago, would you say that has had the result of depreciating the quality of their loaf or have they made up for the use of a greater quantity of Canadian wheat by the use of improvers? Have they been able to maintain the quality of their loaf?

Answer—Conflicting reports regarding the quality of bread in England and Continental Europe appear in the trade journals and I am not prepared to say, from personal knowledge, whether the quality is lower today than it was a few years ago.

Question—Were those analyses you made of the various grades of Canadian wheat made before the grade was set or after?

Answer—The analyses were conducted on average samples of the various grades collected at Winnipeg prior to the meeting of the Western Committee on Grain Standards. The collections represent the wheat passing through Winnipeg from the beginning of the crop movement until a few days prior to the meeting of the Committee in order that the results presented this body shall be as representative as possible, as they are taken into consideration in setting the Standards.

Question—Could you tell us what variation there is in protein content between the top grades of one year and another. Over a period of years, what variation is there?

Answer—The mean protein contents of cargo shipments of grades One Hard to Four Northern inclusive by the different ports for the past few crop years are as follows:

HARD RED SPRING WHEAT CARGOES

Mean Protein Contents of Grades One Hard to Four Northern for Different Crop Years

Vancouver and Prince Rupert

Grade	Mean Protein Content			
	1932-33	1933-34	1934-35	1935-36 (Aug.-Dec. 1935)
	%	%	%	%
1 Hard	14.3	14.2	14.0	14.2
1 Northern	14.3	13.9	14.0	14.2
2 Northern	12.5	12.1	12.3	13.2*
3 Northern	13.0	11.9	11.8	12.4
4 Northern	12.7	11.8	11.4	12.3

Fort William

Grade	Mean Protein Content			
	1932-33	1933-34	1934-35	1935-36 (Aug.-Dec. 1935)
	%	%	%	%
1 Hard	14.5	14.2	14.2	14.5
1 Northern	14.6	14.0	14.0	14.6
2 Northern	13.4	13.1	12.9	14.1*
3 Northern	14.0	13.3	12.8	13.1
4 Northern	14.0	13.0	12.5	13.4

Atlantic Ports (Montreal, Halifax, St. John)

Grade	Mean Protein Content			
	1932-33	1933-34	1934-35	1935-36 (Aug.-Dec. 1935)
	%	%	%	%
1 Hard	14.7	14.2	14.2	14.5
1 Northern	14.2	14.2	14.0	14.3
2 Northern	13.0	12.9	12.6	12.9*
3 Northern	13.5	13.5	12.7	13.0
4 Northern	13.7	13.3	12.6	13.0

Churchill

Grade	Mean Protein Content			
	1932-33	1933-34	1934-35	1935-36 (Aug.-Dec. 1935)
	%	%	%	%
1 Hard .....	...	14.0	13.8	...
1 Northern	13.2	13.3	13.2	14.2
2 Northern	12.3	11.7	12.0	13.4*
3 Northern	11.5	10.8**	12.4	12.3**
4 Northern	11.8	...	...	11.9**

*Includes both "old" and "new" grade 2 Northern. The values for these grades separately are as follows:

Mean Protein Content "old grade" "new grade"

Vancouver	12.70	13.55
Fort William	13.02	14.67
Atlantic	12.79	12.99
Churchill	11.20	13.88

**One sample only.

Question—Is it not a fact that in Canada far more fillers are used in connection with baking than in Europe? By “fillers” I mean milk, butter and eggs, etc.

Answer—Yes, in general, the baking formulas are simpler than those employed in Canada, ingredients such as fat, sugar and milk not being used to any extent except in the luxury types of bread.

Question—It is stated Garnet gives a more yellow flour. Is that appreciable in the loaf or is it only microscopically seen?

Answer—Flour milled from Garnet wheat is distinctly more yellow than that from other widely grown varieties of hard spring wheat, such as Marquis, Ceres and Reward. Accordingly, the crumb colour of bread made from Garnet flour is also distinctly more yellow.

Question—Is there so much yellow pigment it cannot be obliterated by bleaching agents?

Answer—The question can perhaps best be answered by citing examples of data secured on the 1935 crop Winnipeg averages in the Dominion Grain Research Laboratory.

Wheat Grade No.		Flour Carotene (Parts per million)		Crumb Colour of Bread baked from Flour	
		Before Bleaching	After Bleaching	Unbleached	Bleached (Perfect score 10)
1 Hard		1.83	0.91	7.5	8.0
1 Northern		1.88	0.94	7.0	8.0
2 Northern		2.14	1.09	6.5 yellow	8.0
1 C.W. Garnet...		2.86	1.45	4.0 dark yellow	5.0 grey yellow
2 C.W. Garnet...		3.04	1.64	4.0 dark yellow	5.0 grey yellow

In these tests the flours were bleached with Novadelox at the rate of 1 pound per 25 barrels, and it will be noted that while

bleaching materially reduces the yellow colour of the flour and the bread crumb of all grades, the pigment content of the Garnet flour is decidedly higher than that of the Garnet-free grades. This implies that Garnet flour would require heavier dosages of bleaching agent, which would increase manufacturing costs. Moreover, it will be noted that the crumb colour of the bleached Garnet samples has a greyish or dull cast, and this would become more pronounced with increasing dosages of the bleaching agent.

Question—How does Garnet compare with Marquis of equal protein content, say 15% Garnet with 15% Marquis. Would the difference in quality be as discernible?

Answer—When grown under similar environmental conditions, Garnet usually produces wheat of lower protein content than Marquis, particularly in the more northerly districts where this variety predominates, so that the question is rather an academic one. While the lower protein content of commercial lots of Garnet, in itself, is responsible to a considerable extent for its low strength, the characteristics of the gluten are different from that of Marquis and these are reflected in differences in baking behaviour.

Exporting Canadian Grain

The process of merchandising the wheat crop of Western Canada may roughly be divided into two major operations.

The first of these consists, broadly speaking, in all these activities and services, physical and commercial, which result in the accumulation of the wheat in Terminals at Fort William or Port Arthur, Fort Churchill, Interior Inspection points in the prairie provinces, and at the Pacific Coast.

I mention wheat for purposes of simplicity; similar considerations can be applied to coarse grains.

The second major operation consists in the taking over of this wheat from these domestic accumulators by those whose functions lie in finding foreign buyers for it, in other words, the shippers and exporters.

I use the term, foreign buyer, advisedly, because wheat which is consumed domestically is collected by Canadian millers, who have facilities for securing their requirements through their own country elevators or connections.

The historical record of the development of the export business has already been touched upon by at least one previous speaker.

You have heard how, nearly sixty years ago, the first foreign markets were reached by water up the Red River and thence by rail to millers in the United States.

The advent of the railroad from the east and the arrival of the first boat to load grain at Fort William opened up a new era by enabling the west to make contact with millers in the eastern provinces of the Dominion and later with European buyers across the Atlantic.

But the story in which I hope you are all interested at the present time centres around the world's wheat markets of today,

the part that Canadian wheat plays therein, and the manner in which the exporter carries out his job as a salesman for the country contributing, generally speaking, the largest quota of wheat to importing markets.

It is on the energy, enterprise, and the initiative of the exporter that this country relies for keeping offers of Canadian wheat continuously before all present customers, and new ones as these may arise, in order to make sales and secure bids if his offers are unworkable.

It is such sales and bids that enable the exporter to make purchases or bids on the Winnipeg Grain Exchange, which establish the prices which the domestic accumulator already referred to can pay to the producer.

There are shades and variations to this general principle about which something may be said later but, expressed in its simplest terms, that is the point at which contact is made by the producer through the elevator owner or commission merchant with the foreign buyer through the exporter.

MARKETS

The exporter in his search for customers carries his campaign into every country in which there exists, or may exist, a market for Canadian wheat.

There is not a port in the British Isles which is not touched every day with cable offers. There is not a country on the continent of Europe with which the exporter is not in direct communication despite embargoes, subsidies, or tariffs.

His senses are keenly tuned to any sign that such obstacles or handicaps are likely to be modified or removed, and he has friends or connections in such countries ready to seize upon any opening.

Similar contact is maintained with our new markets in the Orient.

The following list of ports to which actual daily offers are in the main being made at the present time will give you some idea of the comprehensive network set by the exporter:

England - - - - Liverpool, Manchester, London, Newcastle,
Hull, Plymouth, Avonmouth.
Wales - - - - Cardiff, Swansea.
Ireland - - - - Dublin, Belfast, Cork, Limerick.
Scotland - - - - Glasgow, Leith, Dundee, Aberdeen.
France - - - - Havre, Boulogne, Brest, Dunkirk, Marseilles.
Germany - - - - Hamburg, Bremen.
Portugal - - - - Lisbon.
Spain - - - - Cadiz, Barcelona.
Belgium - - - - Ostend, Antwerp.
Holland - - - - Rotterdam, Amsterdam.
Denmark - - - - Aarhuus, Odense.
Norway - - - - Oslo, Stavanger.
Sweden - - - - Stockholm, Malmo.
Finland - - - - Helsingfors.
Lithuania - - - - Memel.
Italy - - - - Genoa, Naples, Trieste, Venice, Civitanova,
Palermo.
Greece - - - - Athens, Piraeus.
China - - - - Hong Kong, Shanghai, Tsingtan, Tientsin.
Japan - - - - Tokyo, Kobe, Yokohama.
Manchuria - - - Vladivostok.
Brazil - - - - Pernambuco.
Cuba - - - - Havana.
Central America - Mexico City, Tampico, Campeche, Tragillo,
Panama City.

PRICE STRUCTURE

It has already been shown how the daily bids made by exporters on the Winnipeg Grain Exchange establish a basis for the prices which the elevator company, or others, can pay to the producer.

It then becomes relatively a simple calculation for the elevator company to figure back to each country point, railway rates being stable, as well as elevator handling charges, bank interest, and exchange.

The exporter, however, in arriving at the bids he makes daily does not find the task nearly so simple.

Lake freights as well as ocean freights are subject to fluctuations, sometimes violent; foreign exchange for some years now has been irregular and a disturbing factor in international trade.

Foreign buyers, as a general rule, prefer to trade in the currency of their own country and transactions have at times to be figured in different weights.

The usual weight in Europe is the quarter (480 lbs.) but the unit of the Liverpool future is the cental (100 lbs.) and Paris, Hamburg, and Rotterdam have their own units.

Ocean freights at the Atlantic are usually based on the quarter (480 lbs.) but at the Pacific are quoted in long tons of 2240 lbs.

The British Isles buys in sterling; Holland in guilders; France in francs; Germany in marks; Italy in lira and so on.

Ocean rates from the St. Lawrence ports are seldom the same as from U.S. ports, and with varying combinations of lake and rail rates to the seaboard, some nice figuring has to be done all the time.

On top of all these complications the exporter has the major risk of the rise and fall of the market overnight.

Practically all foreign buyers prefer to trade on a flat basis and the problem which every exporter has to face every night in making his cable offers, is whether he should be long overnight in anticipation of acceptances—in which case he may suffer a loss by reason of lack of business and a consequent decline in the market next morning,—or whether on the other hand he will not go long overnight and take a chance on being able to cover his sales at least without loss in the event of overnight acceptances.

It may be argued that the elevator companies have a somewhat reverse daily problem regarding putting out hedges against overnight purchases in the country. But the cases are not quite analogous.

The elevator people know that they will get some wheat sold to them overnight and generally speaking they can form an approximate idea of how much. They may get stung to a certain extent once in a while but on the average it works out about even.

The exporter on the other hand never knows whether he will get any acceptances or not. He can be reasonably certain that

should some unexpected bullish factor develop overnight all his offers will be accepted, he being left to protect himself as best he can unless he has protected himself overnight by going long some wheat, either futures or cash.

With foreign markets open and functioning several hours before Winnipeg opens, it is a case of "heads I win, tails you lose" with his overnight offers in the hands of his importing connections.

It is true that more recently a very few European buyers have been willing to trade basis the future option, in the same way that practically all cash grain is traded in on the Winnipeg Grain Exchange, instead of on a flat basis, thereby leaving their hedges in the Winnipeg futures to be lifted at their own discretion.

There is also the occasional buyer who at times will book his own ocean freight, but these are exceptions and not in accordance with general practice.

HEDGES

This brings me to the question of hedges and the part which the futures market plays in the exporter's operations.

To a large number of people, even in the trade itself, hedges are associated solely with the impression of sales of futures as protection against purchases of wheat at country points, such sales of futures being bought in against sales of cash wheat when the latter has been delivered at a terminal and in position for sale.

They fail to see the reverse side of the picture in which the exporter immediately hedges his sales abroad by purchases of futures. If his sale abroad consists of a grade of wheat which he had previously purchased and had kept hedged by a sale of Winnipeg futures, the exporter's purchase of futures against his sale abroad washes out his previous hedged sale and the transaction is complete.

It must be clearly understood, however, that the exporter cannot possibly be expected to carry stocks of all grades of wheat for which he is endeavoring to find buyers through his daily overnight cable offers. This would either make demands on his resources with which he could not hope to comply or it would seriously cripple the freedom of his efforts to effect sales.

In such cases his purchase of futures as a hedge against sales abroad is not washed out until he picks up enough of the grade

covered by his foreign contract, selling out his long hedges as he does so.

I wish to make this operation quite clear, because it is in the meeting of hedging purchases of futures against sales of wheat abroad with the hedging sales of futures against purchases of wheat at country points that, in its primary element, creates and maintains the Winnipeg futures market.

In both of these methods of handling his hedges there emerges another hazard which the exporter must face, that of the fluctuations in the spreads of the various grades of wheat. It is the reverse of the picture which the elevator people face in their country purchases. It should be admitted, however, that the exporter is protected in grade and dockage by a government certificate. He is not at the mercy of the optimistic elevator agent who allows himself to be persuaded that Two Northern is at any time One Northern.

Thanks to the heavy annual carry-over under which this country has labored during the past few years, the risk of fluctuations in spreads has not been so great as it was when the carry-over at August first was around 25 to 30 millions. The large carry-over of recent years ensured an abundant supply of merchantable grades right into the new crop. Prior to the period of the large carry-over the problem of spreads likely to prevail during the months of August, September and October was usually very acute and added considerably to the exporter's difficulties.

There are some grounds for hoping that within the next year or so, our carry-over will be reduced to reasonably low proportions, that our stocks of wheat will cease to be held by one hand, but rather will be allowed to find their way into consumption channels naturally, at their market value, so that the decks may be cleared for the following year's crop.

Should these hopes be realized and should the United States get back to the position of being an exporter of winter wheat, Canada will have to face the problem which it has had to face before, of having to compete with winter wheat which is harvested in June, two to three months in advance of Canadian wheat, or, in default thereof, allowing winter wheat to pick off the cream of the European business, in the fall.

The latter alternative is surely unthinkable, and, thanks to the functioning of the Winnipeg futures markets, the exporter is

able to hold his own in foreign markets by hedging, through purchases of October futures, sales abroad for fall shipment made in the late summer or early fall, weeks before the movement from the country commences.

It is under such conditions at that particular period of the year that the speculator in the mass provides that cushion, that measure of insurance which enables the exporter to make long distance sales and protect himself by hedging purchases of futures from the speculative element.

There is usually sufficient cash wheat available in the other months in the year in which futures are traded, to make the value of the speculator less apparent; but it is in that period between crops, under normal conditions, that he is a decidedly useful factor. His subsequent covering purchases have in years past formed a not inconsiderable support for part of the fall pressure from the country.

From the point of view of the exporter, therefore, and of the Dominion as an exporting country, the maintenance of the free open futures market is a prime essential.

The world's wheat market is not located in any one centre. Wheat is now harvested during every month of the year in some part of the world, as the following record will show:

WORLD'S WHEAT HARVEST

January and March—East India and Upper Egypt.

April—Lower Egypt, Syria, Cyprus, Persia, Asia Minor, India, Mexico, and Cuba.

May—Algeria, Central Asia, China, Japan, Morocco, Texas, and Florida.

June—Turkey, Greece, Italy, Spain, Portugal, South of France, California, Louisiana, Mississippi, Alabama, Georgia, Carolinas, Tennessee, Virginia, Kentucky, Kansas, Arkansas, Utah, and Missouri.

July—Roumania, Bulgaria, Austro-Hungary, South of Russia, Germany, Switzerland, France, South of England, Oregon, Nebraska, Minnesota, Wisconsin, Colorado, Washington, Iowa, Illinois, Indiana, Michigan, Ohio, New York, New England, and Eastern Canada.

August—Belgium, Holland, Great Britain, Denmark, Poland, Columbia, North and South Dakota, Western Canada.

September and October—Scotland, Sweden, Norway and North of Russia.

November—Peru, South Africa and Argentina.

December—Australia, Burma and Argentina.

Consumption also goes on all the year round. The open market ensures that the price of all wheats shall find its correct level or, as it is called, its parity. If the price gets too high, the demand switches to other varieties; if it gets too low buyers quickly recognize the fact and demand creates the necessary adjustment. Speculators are fully alive to this feature, and spreading between markets frequently acts as a powerful corrective to unwarranted price levels.

PARITY

It might be well to touch briefly on what has been referred to as parity.

Ninety per cent of the flour consumed in the British Isles is milled there. Milling plants costs less, labor is cheaper, but most important of all, British milled flour is a blend, and in the science of blending, the British miller is an artist. He has to be.

He uses one wheat for strength, another for color, and another for yield, etc., and he keeps a close eye on the going prices of all wheats which have these attributes.

If Manitobas get out of line he reduces their percentage in his mix and substitutes other wheats, making nice adjustments all round, so as to maintain uniformity of quality and appearance as far as possible.

It is in Liverpool that the term parity has come to be most frequently used and it seems to have created a tendency to regard Liverpool futures market as an index of the world's markets, on the theory that Liverpool is the melting pot of most, if not all, of the world's main varieties of wheat.

I suggest that this assumption is not entirely warranted and that undue significance is frequently placed on the level of price of the Liverpool futures as compared with the levels in other markets, especially Winnipeg.

You all know that there are certain defined grades of wheat deliverable at the seller's option on the Winnipeg futures market, One Northern at the delivery price, and Two, Three and Four Northern as well as Garnet grades at varying discounts.

You also know that there is little or no variation in the quality of One Northern from one crop to another, that there is only a slight variation in Two Northern, with further possible variations in the other grades.

It does not follow that the trading level of the current future is the price of One Northern which, while it cannot be below the price of the future, may command a premium, at times small, but at other times quite substantial, as some members of the Exchange will vividly recollect.

The other grades, while they can hardly go to a premium on the future, can, and frequently do, go to a premium on their statutory discount under the future.

It is all a question of supply and demand, the grade or grades which are in fact finally delivered on the future being those grades which usually feel the poorest demand from exporters or millers.

Naturally, on a One Northern crop, that becomes in trading practice the delivery grade, while on a Three Northern crop, that grade is delivered, and holders of the futures who desire One Northern have to pay a premium for it to avoid being delivered Three Northern.

Now, in Liverpool, the system is much more complicated. There is a grading committee which passes on wheat tendered on futures contracts, without whose say-so such wheat cannot be delivered.

In the cases of countries like Canada and the U.S.A., the only countries which have an official grading system, this committee decides the deliverability of each grade and the premium, or otherwise at which it may be delivered and, thereafter the basis of tender becomes automatic. For instance, Three Northern at the present time is deliverable at a premium of one-half penny per cental or roughly $\frac{5}{8}$ c per bushel.

But with regard to wheat from Australia, Argentina, Russia and other countries which have no official grading system but which ship on a f.a.q. basis, each shipment is subject to the scrutiny of this committee.

It is obvious, therefore, that should the f.a.q. of any country be relatively low and in more plentiful supply than millers desire, the unwanted stock of this wheat sets the level of the Liverpool futures market, all other deliverable wheats trading at a premium.

It is within the recollection of some of you that during the past year, the Liverpool futures market was unduly depressed because of the existence in store at Liverpool of some Argentine wheat of relatively poor quality, which had originally passed the committee but which was below the f.a.q. of the current crop and of other tenderable wheats.

It was not until this had been gradually absorbed by British mills and worked off in their mix that Liverpool futures came back to a point more accurately reflecting world conditions.

Unless, therefore, one knows the relation of Liverpool futures to what wheat is likely to be delivered, a lack of perspective is liable to occur.

At one time in years past, when carry-overs were light, American winter wheat dominated the October future in Liverpool, Manitoba wheat the December future, and Argentine wheat the March future.

This has to a certain extent been confused during recent years by the piling up of surpluses in some exporting countries, which have "muddied" this former significance of the Liverpool market quotation.

Attempts, therefore, to establish a relation between the current Winnipeg future and the corresponding Liverpool future are apt to be misleading.

As a simple example, Three Northern is deliverable in Winnipeg at eight cents discount, but generally trades at a narrower difference, while in Liverpool it is deliverable as already explained at a half-penny premium and usually trades at a higher premium.

FOREIGN EMBARGOES, SUBSIDIES AND TARIFFS

Reference has been made to those embargoes, subsidies, and tariffs imposed on wheat imports by foreign countries, and which create such formidable obstacles to the exporter's efforts to find markets for Canadian wheat.

The financial crisis of 1929-30 may have been due to world wide over-expansion, but it may be fairly claimed that recovery

has been delayed by governmental restrictions hampering international trade.

So far as wheat is concerned, the uneasiness regarding possible difficulties in obtaining supplies when required in times of stress, which inspired foreign governments to stimulate home production by means of embargoes, subsidies, and tariffs, can reasonably be attributed to the hold-up policy of the U.S. Farm Board, aided and abetted by the Canadian Pools at and after the crisis referred to, and which subsequently resulted in piling up those surplus carry-overs in Canada which have hung round the neck of the Dominion ever since.

The reaction to centralized selling on this side in the British Isles did not run to government interference, but it did lead to concentration in buying, and, ultimately, to absorption of many small mills by the larger milling interests, with the result that, at the present time, the buying power in the United Kingdom is largely confined to a few powerful concerns.

As an interesting side-light on the effect of tariffs, you should know that as a result of the preference on Empire Dairy Produce established by the Ottawa conference, the famed dairy industry of Denmark received a shattering blow, its market in the British Isles being shut off in favor of Canada, Australia and New Zealand.

Danish farmers had, therefore, to reconstruct their farming methods, and they turned their attention to growing wheat. They raised 25 million bushels where previously they had been importing this amount, mostly from Canada, and Canada lost this business in favor of a fractional advantage to her dairy farmers.

The conclusion seems inevitable that it is sound economic policy, which all countries should endeavor to follow and encourage, that each country should be permitted perfect freedom to produce those goods which nature has best equipped her to produce.

And until the governments of the world get back to this fundamental principle, the export business in Canadian wheat will continue to operate at a handicap.

COMMUNICATIONS

One of the main factors in today's world trade has been the remarkable advance in the speed of communications and the quickness with which buyers can exchange information, figures, quotations, and other data, with sellers.

The usual time taken nowadays for a cable to reach London from the floor of the Exchange, in the ordinary way, is around three minutes, but under pressure, actual time taken has on occasion been only forty seconds.

I can also recollect making a sale of one million bushels to British millers through their representative on the floor here at 9.15 a.m. The trade was kept strictly quiet on this side, but when at 10.30 a.m.—75 minutes later—I asked one of my friends on the floor what he figured the export business was, his reply was that surely I knew more about that than he did, and he gave me the rough details of the trade I have mentioned.

I enquired of him where he got his information, and he replied that it had come by wire from his people in New York, who in turn had received the news by cable from the other side.

So that a trade made on this floor was not known here, until the news had filtered back from the other side, and that happened within an hour and a quarter.

SEABOARD OFFICES

It has been found essential in order to give the fastest, most complete, and most accurate service to their customers, that exporters should maintain offices at the seaboard instead of attempting to do the business direct from Winnipeg.

The Winnipeg offices can make all arrangements at their end for transporting the wheat to the ocean port, but when it comes to chartering ocean space, arranging for loading to the ocean steamer, covering ocean insurance, completing documents covering the ocean shipment, and making banking arrangements for collecting payment, offices at the seaboard are much more effective.

Most of the exporters maintain such seaboard offices, while a few others work through agents, but in either case the overhead cost of maintaining such an office does not exceed a quarter of one cent per bushel, and as a matter of fact, the Exchange rules set this figure as the commission chargeable by members to other members for shipping wheat from Fort William to the seaboard.

PAYMENT

You might like to get some general idea of how the exporter gets paid by his foreign buyer. The process is really as simple to a banker, and usually as mysterious to the ordinary man, as trading in cash wheat basis the futures is mysterious to the outsider, but is so simple to the grain man.

If there were no banks, and one man, "A" in New York, desired to collect, say five thousand dollars, from someone "X" in London, it would obviously simplify matters considerably if "A" could contact with another individual, "B" in New York, who desired to pay an equal sum to someone, "Y" in London, that is assuming that all four parties were sound financially and agreeable.

In that case "A" would collect from "B" in New York instead of from "X" in London, and "X" would pay "Y" in London instead of "A" in New York. By this means both transactions could be completed without any money crossing the Atlantic.

What the banks do is to take over this service and act as a clearing house for all parties, first by cashing the exporter's Sterling draft on London, converting it into dollars at the current rate of exchange, as they have other customers desiring to carry out the reverse transaction.

The rate of exchange fluctuates, therefore, according to whether the demand for London money in New York exceeds or is less than the supply of New York money available for transfer to London.

With all banks in New York giving this service and a similar service being given by banks in London, the money market is more or less fluid and there exists a regular market for money as for any other commodity, and exchange, or trade in money, fluctuates like any other article.

Similar principles govern trade with other foreign countries.

OCEAN ROUTES

In conclusion, I would like to say that exporters have no sentimental preference for trading through any port or ports. They are just as ready to do business through Vancouver, or Fort Churchill, as through the Atlantic ports. It is all a question of figuring out the most economical way of getting wheat to the importing countries.

To the Orient, of course, Vancouver must take first place. To Europe the Atlantic generally has an advantage over the Pacific in cost and length of voyage, so that the business out of Vancouver is largely confined to those months when the Great Lakes and the St. Lawrence are frozen up.

Business via Fort Churchill is handicapped by the shortness of the season, but if tonnage is available and the wheat is placed in the terminal elevator there by those domestic accumulators to whom I have referred, exporters who can overcome the complicated

risks via other ports, are not likely to pass up business via Churchill if it can be done.

If these few remarks give you a brief, rough picture of how the exporters use their best energies and ingenuity in their efforts to sell Canadian wheat to foreign buyers; if your imagination can follow boats loaded with Canadian wheat sailing the seven seas to all sorts and varieties of ports, so that it can be milled and consumed by all kinds of people in their own peculiar kind of way; if, in any way, it makes you realize the part which each of you in his own sphere is playing in what is one of the oldest, greatest, and most fascinating industries in the world, then I will feel amply repaid for what I have been allowed to contribute to your series of lectures.

QUESTION AND ANSWERS

Question—Is Australian wheat sold on an f.a.q. or graded basis?

Answer—Australian wheat is sold on an f.a.q. basis.

Question—Mr. Mathieson was telling us about how exchange was worked between a purchaser in the Old Country and a seller in New York. Could he go further and explain this question to me?

A debtor nation which has not gold to export, the economist tells us, wipes off its debts by goods or services. Now, I would like to get the connection between the farmer and the government. They say the government cleans up debts in this way. Is it not really privately owned goods that are exported; therefore, the private person or farmer has the money and not the government?

Answer—The question, gentlemen, which is asked, is somewhat complicated and comes more within the realm of international banking. Mr. Rae dealt with certain aspects of this problem in the last lecture to you. The exporter's problem lies in being able to cover his exchange requirements when he trades, leaving the economic issue to others.

Question—Lake bills of lading are made out usually for the amount in the hold. Sometimes wheat sold for export is split into 8,000 bushel lots. Why is this necessary, or is it necessary, or is it just habit?

Answer—The general unit of trade, as I have explained, between Canada and Europe, is in quarters of 480 lbs., and 8,000 bushels is 1,000 quarters, and that is the normal unit. When shipment is made from the Head of the Lakes for a hold containing 60 or 65 thousand bushels, documents are almost invariably made

out in 1,000 quarter lots, as nobody knows, when the shipment is made at this end, how sales will be made at the seaboard, whether in 1,000 quarter lots or 5,000 quarter lots, or 1,500 quarters. Further division, if necessary, has to be made subsequently at the seaboard.

Question—I would like to suggest you say something about “fair average quality”.

Answer—Mr. Brockington suggests I might say something about what is called “fair average quality”. “Fair average quality” (f.a.q.) means exactly what the words convey. It is a fair average quality of the yields of that particular crop, and the fair average quality of one crop may be lower or higher than another.

In the case of Argentine wheats, it is usual to tack on, in addition to the f.a.q. clause, the district from which the grain was received—Rosafe or Baruso, for instance—and they add in addition the bushel weight. Sometimes that bushel weight is lower in one year than in another.

In this country One Northern is fairly uniform, but you know Three Northern from one year to another is not the same. In some years you may get Three Northern very largely frosted, and in others badly bleached. Some change is taking place in the quality of Three Northern by reason of the presence of Garnet wheats.

An “f.a.q. basis means a fair average quality of that particular wheat for that crop only.

Question—It might be of interest to know how the daily due cable quotations are determined.

Answer—This is a purely arbitrary method by which some people arrive at what are called these due quotations. I believe the idea originated in Chicago. It is not official; it is not done by the Exchange and very often there is no sound basis for it. What is done is to take the future quotations at the moment Liverpool closes and again of our market afterwards. If, for instance, at 10.30 a.m., the hour at which Liverpool closes, Winnipeg May was 79, and at the close at 12.15 it was 79- $\frac{1}{2}$, Liverpool would be due $\frac{1}{2}$ up.

Question—Are shipments made for export in bulk as we understand them here? If an exporter has a sale of ten loads of wheat to Great Britain, two loads to Holland, and three loads to France, would it be possible that these might all be loaded in the same hold?

Answer—Not very likely, because these sales are not made to go to the same ports. If the same grade is loaded to several buyers at the same port, it could be loaded in the same hold. Shipments are made on bulk on ocean steamers the same as on lake steamers.

Question—Mr. Mathieson mentioned exporters buying October futures. I do not understand what the exporters would be buying against.

Answer—You understand that the winter wheat crop in the United States is harvested in June, and is usually offered abroad for July, August and later shipments. Under normal conditions, Canada's carry-over would be getting down to the vanishing point, and if exporters had to wait until the farmer was ready to sell, Canada might miss her market. Sales for September, October and November shipment might be made in June and July, in competition with winter wheats, in order to hold our markets, but the exporter is not in a position to buy those grades which at the date Europe wishes to buy, because there is nobody in a position to sell him. He makes a sale, say of 100,000 Three Northern at a price for October shipment, and relies on being able to get that Three Northern when the time for shipment comes. Meanwhile, he protects himself until such time as he can get his Three Northern by buying 100,000 bushels of October futures, and carries these until he replaces them by purchases of Three Northern.

Question—Is any great quantity of that done?

Answer—I can remember when there was a large business done for September, October and November shipments weeks ahead of the shipping date.

Question—Re wheat arriving in Liverpool from countries which have no cleaning facilities. Do they take the dockage out before they arrive at a fair average quality?

Answer—To the best of my knowledge, Canada and the United States are the only two countries which clean their wheat before it is shipped, automatically. The other countries may clean it before it is shipped in order to make the grade as high as possible and to make it stack up to a fair average quality basis. So far as delivery in Liverpool is concerned, wheat is taken as it comes out of the steamer, dumped on the dock and delivered in store. There is no cleaning carried on there unless the buyer feels the sample will not pass the committee and desires to raise it up to a point where it will pass the committee.